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EDITOR:—T. CHERRY, M.D., M.S., Director of Agriculture.
ASSISTANT EDITOR:—A. T. SHARP.

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THE JOURNAL

OF

The Department of Agriculture.

Vol. VII. Part 1. 11th January, 1909.

VALENCIA RAISINS OR LEXIAS.

F. de Castella, Government Viticulturist.

Though the pudding raisins so largely consumed in English speaking countries are usually known as Valencias, very few are grown in the neighbourhood of the city of that name. The small seaport town of Denia, some 40 miles to the south, in the extreme north of the province of Alicante and within a few miles of the boundary between it and Valencia, is the real headquarters of the industry. It is in its neighbourhood that the great bulk of these raisins are grown, dried and packed. Denia ships annually some 25,000 tons as against Valencia's 1,000 to 1,500. The Port of Gandia, about half way between the two, and chiefly celebrated for its oranges, tomatoes and onions, also contributes a couple of thousand tons.

The term Lexia is perhaps more logical, indicating, as it does, the mode of manufacture. It is a corruption of the Spanish word Lejia (*pronounced Le-hé-a) which means lye, referring to the alkaline solution* into which the grapes are dipped before being dried, for the raisins of this part of Spain are almost exclusively Pasas de Lejia (lye raisins), as distinguished from Pasas de Sol (sun raisins) such as those of Malaga. Lexias are sometimes also termed Pasas Caldadas (boiled raisins) for the lye in which they are dipped is boiling hot.

We have in the Denia raisin industry another striking example of that specialization to which I have several times had occasion to refer and which is so noticeable in the viticultural regions of Europe. Denia is the home of the pudding raisin, just as Malaga is that of the dessert rasin. Though both appear to be made from the same "Moscatel" grape, identical with our Gordo Blanco, it seems as difficult to turn out a first class pudding raisin at Malaga as it is to dry a high grade dessert muscatel at Denia. Experiments in both directions have been made on a large scale. When phylloxera ravaged Malaga nearly 30 years ago and her production suffered in consequence, Denia, thinking her sister's misfortune might prove to be her opportunity, set to work to produce dessert raisins. Drying grounds or toldos were built, exactly similar to those of Malaga, and they are still to be seen about the district where they are known as Seceros de Pasas de Malaga. They are now, for the greater part, unused, the production

of the lexia having proved more suitable for the district. At the present time only a couple of hundred tons of dessert raisins are dried annually in the neighbourhood of Denia. In similar manner the extensive production of pudding raisins was attempted in Malaga in a season of excessive yield but success was not complete. Denia men tell one that the Malaga lexia lacked substance &c. At any rate, the time honoured practice has been in both cases reverted to, and to-day Malaga produces almost exclusively the dessert raisin as Denia does the lexia. Nor is wine produced to any extent near Denia—small quantities are made here from such varieties as Marseguera and Bobal, but local requirements are chiefly provided for with wine from other regions, the production of pudding raisins and a few table grapes absorbing all the viticultural energies of the district.

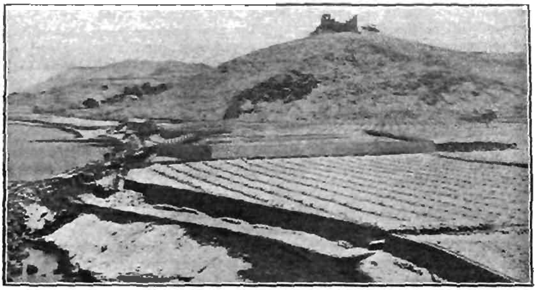
Denia is as yet free from phylloxera, at least officially so. The presence of the insect has not yet been observed in the raisin vineyards though it has made its appearance at Gata in one of the valleys, some ten miles distant. The invasion of the whole district appears to be merely a question of time and it is highly probable that, within the next few years, the production of raisins will be very considerably reduced. Reconstitution on resistant stocks will, no doubt, be actively undertaken though as yet but little preparation has been made for it, but this will take time and a considerable shrinkage in the production of this, the most important raisin district of Spain, seems to be inevitable. Nothing appears to have been done to prevent the introduction or spread of the pest. It is true that a few growers are experimenting in a small way with resistant stocks, but these are procured from infested districts, and may even be the cause of the introduction of the insect. Numerous healthy vineyards on their own roots are to be seen, often recent plantations, as is evidenced by the youth of the vines, and it is melancholy to think that these are doomed to destruction within the next few years.

There was nothing to be learnt in this district so far as reconstitution is concerned but much of great interest in the way of drying, packing and marketing raisins. I reached Denia on 16th January, 1908, by train from Valencia, after breaking my journey for a day at the intervening town of Gandia. I was the bearer of a letter to Señor J. Ramos who was unfortunately unwell at the time. He referred me to Don Juan Morand, one of the leading viticulturists, who received me most kindly and to whom I am chiefly indebted for the information which follows.

Denia is a picturesquely situated town of great antiquity being of Phœnician origin. Like Sagunto (Murviedro), immediately north of Valencia, it is one of the oldest towns on the east coast of Spain or Levante. Its handsome old castle or rather fortress, situated on a high hill, gives it a striking appearance. The greater part of the town itself is modern and the result of the raisin industry. Taken as a whole it is well built and clean, with fairly wide streets.

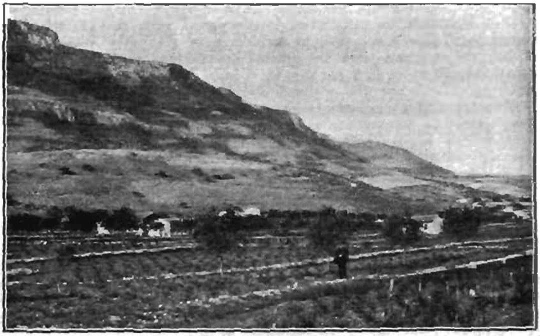
Along the eastern coast of Spain, agriculture is confined to that strip of land of varying width, between the sea and the high rocky hills which, except near the mouth of a river or large creek, are never very far from it. In places where it consists of deep alluvial soil this strip is often extraordinarily rich, but immediately south of Denia the hills run right down to the sea ending in the imposing headlands of Capes San Antonio and San Martin: whilst near the town itself the strip is narrow and most of the land undulating, there being but little level land about. Water for irrigation is scarce and the soil being only of medium richness, it is

better suited for the cultivation of the vine than for that of the orange or tomato, which find their place on the rich irrigable flat lands further north. Hence it is that the vine has been so extensively planted and has become the leading feature of the district and the chief source of its prosperity.



1. SNOW STORM NEAR DENIA, FEBRUARY, 1907.

The photographs here reproduced will serve to give some idea of this part of the country and of the situation of the raisin vineyards. No.



2. RAISIN GROWING LAND NEAR DENIA.

1, taken after the snow storm of February, 1907, shows a most unusual occurrence for snow is rare in these parts. It nevertheless illustrates the fact that the climate is colder than that of our Australian vine districts and colder than Malaga where snow is unknown.

The most striking feature of the soil is its redness, a colour unusual in Spain, but which reminded me of several of our Australian soils. In texture, this soil is also similar to many Australian ones, being on the average a substantial loam. In the lower levels it is fairly stiff but more stony as one rises up the sides of the hills which are of hard limestone rock. The soil, I was informed, does not contain a high percentage of carbonate of lime. Some paler coloured clayey soils are to be met with in the lower levels. They also produce very good raisins, but the majority of the vineyards are on red soil which is more plentiful.

Irrigation is not applied to the vineyards; the rainfall seems to be sufficient without it. It is said that irrigation would interfere with quality and lead to the production of a raisin deficient in substance. The vineyards ascend the hills to a considerable height, most of those in the upper levels producing excellent raisins.

Don Juan Morand took me out to his fine property at Alter, one of the best raisin vineyards in the neighbourhood and typical of most of those in the district.

CULTURE, PRUNING, ETC.

I was anxious to obtain information as to the identity or otherwise of the "Moscatel" locally grown with that of Malaga, which appears to be the same as our Gordo Blanco. Opinions were not unanimous on the point: though most of the authorities I consulted consider that there is only one large white Muscat grown in Spain and that the vines of Malaga and Denia are one and the same variety, others again say there is a slight difference between them. The question can only be finally solved by the importation of vines from each locality and their careful observation under exactly similar conditions. I am strongly inclined to think that they are one and the same variety.

The vineyards are established in the usual way, though subsoiling before plantation is not perhaps considered so absolutely essential as it is in districts where vines are grafted on resistant stocks. The most usual distance apart is 8 ft. x 3 ft. 6 in.; formerly they were planted closer but this is now the accepted distance.

Pruning differs considerably from the Malaga system, the vines being short pruned in exactly the same way as wine vines trained gooseberry style. Five to six spurs, of 2 eyes each, are left on each vine, the arms of which elongate in the ordinary way instead of forming the mushroom shaped crown characteristic of the Malaga system. Summer pruning or training is the same as at Malaga, the vines being grown gooseberry bush system and neither trained nor tied up in any way.

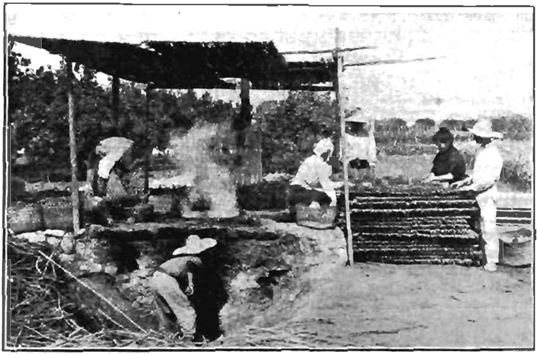
Cultivation is executed with the old fashioned wooden plough or arado, the vineyards being kept in very good order. Manuring is practised, a dressing of seaweed and stable manure being usually applied every second year. Property is much subdivided about here, being often owned or leased in small farms. Working on the shares system is not uncommon: the produce is equally divided between landlord and tenant—in former times the proportion was 9 parts for the proprietor and 7 for the tenant but it is not now easy to find tenants prepared to work on this basis.

I experienced some difficulty in getting information as to average yields for, although the metric system has long been in force in Spain, it is remarkable to what an extent the old weights and measures are still employed, especially in connexion with land and agricultural

produce. Unfortunately for the traveller in Spain the units vary considerably according to the province one is in. In Denia, land is measured by the Hanegada of 16.200 Palmos quadrados, equivalent to .07 hectares or about $\frac{1}{6}$ of an acre. Grapes are measured by the arroba of 28 lbs. approximately; 20 arrobas of raisins per Hanegada is considered a good crop. This would work out at somewhat under a ton and a half of dried raisins per acre. It is estimated that it takes 14 arrobas of grapes to make 4 arrobas of raisins.

GATHERING AND DIPPING.

Denia raisins are all dried in close proximity to the vineyards where they are grown; they are gathered in baskets, brought to the dipping sheds, dipped and spread out on trays to dry in the sun in much the same way as we dry ours in northern Victoria. As a rule, the vineyards are small and the drying being done by the grower and his family, the scale on which operations are carried out is not large. The photographs reproduced will give an idea of the work on a medium size vineyard.



3. RAISIN DIPPING.

The grapes, which are not gathered until thoroughly ripe, are brought in baskets to the dipping shed, usually a simple skillion roof covering the caldero or boiler which contains the lye in which they are dipped. The object of dipping is to shorten the time of drying; whereas Malagas, as a rule, take three weeks to dry, the dipped grape is usually converted into a raisin within four to six days. The lye acts in several ways. The alkali it contains attacks and destroys the protecting waxy layer of bloom on the outside of the berry; it also has a destructive effect on the cells of the outer skin which is rendered more penetrable thus enabling the water of the pulp, heated by the sun's rays, to evaporate more readily. The high temperature of the lye has a sterilizing effect and is responsible for the destruction of spores of mould which are thus prevented from damaging the fruit during the drying process.

The operation of dipping is very simple. It is performed by means of a wire basket fixed to a long handle, known as a "cazo," in which the grapes are placed. The lye is kept almost on the boil and the time of immersion is very short—not more than one second about. The process is illustrated in photograph No. 3 which shows the cazo being filled with grapes by an assistant on the right hand side of the man who does the dipping. It is then plunged boldly into the lye and lifted out again; just dipped through it in fact. After draining for a moment it is emptied on to the drying tray by other workmen on his left. The grapes are spread evenly on the trays which are then exposed to the sun on the drying ground. One man working the cazo, with six assistants, is expected to dip four tons of raisins per day.

The trays used differ a good deal from our wooden ones. They are made of bamboos fixed together by transverse wires and stouter bamboos. Their construction may be seen in photographs Nos. 3 and 7. The material used is entirely a question of convenience. In Spain, labour is cheap and wood is scarce and expensive. Bamboos, known as Caña, abound and cost practically nothing. Throughout the country they are a familiar feature and are used for all sorts of purposes. These raisin drying trays are home made during periods of the year when work is slack.

RINSING BEFORE AND AFTER DIPPING.

In their recent report on Raisin drying in Tunis (issued by the Tunis Government) M. M. Minangoin and Couston attach great importance to this point. They refer to preliminary rinsing as being much practised by Denia dryers. As they point out, the lye becomes more and more soiled by foreign matter, such as earth, dust, &c., which may be on the grapes and which accumulate in it until, after a certain time, it becomes black and muddy and must be changed. Rinsing the grapes in fresh water before dipping removes much dirt and rubbish and makes the lye last a good deal longer.

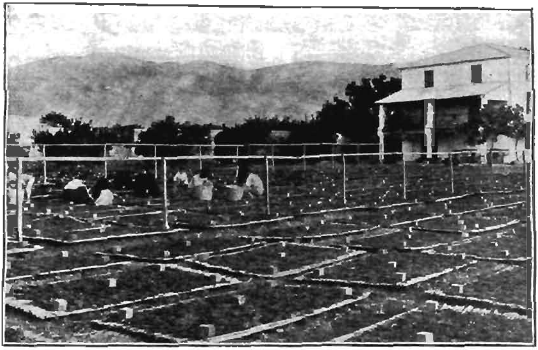
Rinsing after dipping is less usual and its utility is questionable. Though it removes excess of alkali, and should thus improve the flavour of the raisins, it seems to render them more liable to the growth of moulds, if wetted by rain or dew during the drying process. The slight excess of alkali appears to have a preservative influence. The above mentioned authorities seem inclined to think, however, that washing, provided due precaution be taken against rain or dew in drying, would prevent stickiness due to excess of alkali and thus give a drier and better quality raisin.

On the vineyard I visited the grapes were not washed either before or after dipping. It was only after my return to France that I read the Tunisian report in which rinsing is referred to.

DRYING.

Though the trays differ from ours, the general appearance of a drying ground in Denia is very similar to what we are accustomed to, (see photograph No. 4.) The fruit is turned in the ordinary way by placing an empty tray over the full one, and rapidly rotating the two so that the grapes are transferred to the lower one, fresh portions of the bunches becoming exposed to sun and air. In a general way, drying is conducted on very similar lines to those followed by raisin dryers in Victoria, the chief difference consisting in the greater need for protection

from dew and rain. Denia being situated on the coast, climatic conditions are very different from those prevailing in inland Victoria. Every evening the trays are stacked and covered with a sort of tent, the under side of one tray being prevented from coming in contact with the fruit on the one below, by five square blocks of wood, one in the centre and one at each corner of each tray. Ridge poles supported by permanent posts are to be seen in all drying grounds. It is under these that the trays are stacked at night, the tent being placed in position as



4. A DRYING GROUND.

shown in photograph No. 6. Should rain threaten, as is not uncommon in the autumn, the trays are stacked and covered and thus protected from damage.

Composition of the Lye.

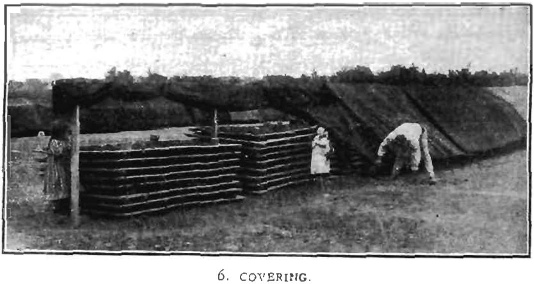
The lye in which the grapes are dipped is said to have a considerable influence on the quality of the raisin. Great importance is attached to this point and much care is given to its preparation in Denia. Caustic soda is scarcely ever used. I was told that it produces a sticky raisin of poor quality. The only way in which it is used is to rapidly increase the strength of the potash lye but, even to this small extent, its use is looked on with disfavour. It is never employed alone. It is possible this inferiority may be due to the salts resulting from the neutralization of the alkali by the tartaric acid of the grape. In the case of a soda lye the tartrate formed would be more likely to retain moisture than the sparingly soluble potash bi-tartrate (cream of tartar) resulting from the use of a potash lye, and might lead to the stickiness complained of.

The point seems to me to be of importance and to be worth testing by comparative experiment. I therefore secured the recipe for the preparation of the lye employed in Denia* which is as follows:—Eight barchillas (a Spanish measure of about 1½ gall. capacity) of ordinary wood ashes mixed with two of vine ashes are placed in a large jar, into the

bottom of which a bamboo spout is fitted the entrance of which is so protected with small stones, gravel and sand, as to constitute a sort of strainer. A hollow is excavated in the centre of the mass of ashes in which is placed two barchillas of quick lime. The lime is slacked by

5. STACKING.

the gradual addition of small quantities of water, the lime and ashes are then thoroughly mixed together; a few sprigs of rosemary are buried in the upper part in order to aromatize the mixture, and cold water is poured over it. This dissolves and carries away the soluble portion

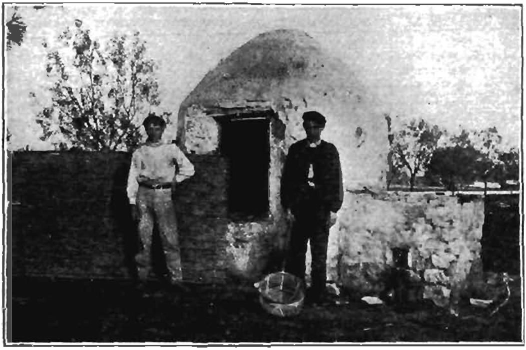


6. COVERING.

which escapes through the pipe and is stored in earthenware jars. The above quantity of ashes and lime yields 8 barchillas of first quality and 4 of second quality stock solution.

This solution requires further dilution for use—the exact quantity of water to be added must be determined by experiment as the strength of the stock solution is variable. It is judged by the effect the lye has on a trial bunch of grapes. The strength must be sufficient to slightly

cut the skin of an odd berry of the bunch only. The strength should be such as to only produce very fine but numerous cracks near the insertion of the stalk and not to cause large cuts. A good deal of skill and judgment is required to keep the lye at a proper strength and at a proper temperature without losing too much time and keeping the assistants idle. The addition of a little full strength lye and of a little water every quarter of an hour or so insures this. A cunning man in charge may, occasionally, purposely allow his lye to become too strong —*the necessary reduction by a large bulk of water will lead to a fall* of temperature which will need correction and call a halt in the work which leads to the smoking of cigarettes by all hands.



7. SPANISH WELL AND ARRANGEMENT WHERE LYE IS PREPARED.

Such is the lye usually employed in Denia. Prepared, as above explained, it is often kept from one season to another in earthenware jars or tinajas. The carefully sifted ashes needed for its preparation are stored in bins in the storeroom of the homestead and have a regular market price. Vine ashes are of most value; at the time of my visit they were quoted at 7 reals per barchilla of 6-7 kilos—this would work out at a little under 10s. per cwt. Sifted wood ashes were quoted at 2 reals.

Photograph No. 7 shows, to the right, the jar built into masonry in which the lye is made: the bamboo pipe by which it escapes passes through the square hole rather less than half way up. In the centre, leaning against a typical Spanish well, vaulted over to keep out dust and rubbish, is a man holding by its handle a "cazo" or wire dipping basket; to the left is seen portion of one of the drying trays.

OTHER FORMS OF LYE.

Messrs. Minangoin and Couston mention several other sorts of lye which are used in Eastern countries, chief amongst which are:—

Caustic Potash Lye.—Made by dissolving 1 lb. of caustic potash in 20 gallons of water which should be nearly boiling.

Caustic Soda Lye—Three-quarters of a pound of caustic soda (75-76 per cent.) in 20 gallons of water. Used by raisin growers at Cape Bon in Tunis.

Carbonate of Potash Lye—A popular strength is 3 per cent. of carbonate of potash or 3 lbs. to 10 gallons.

Another formula in use in Smyrna for dipping Rosaki and Sultanas is as follows:—Carbonate of potash 13 lbs.; water 22 galls.; olive oil 2½ quarts. The addition of oil to lye is not practised in Spain though it has been general in Arab and Turkish countries since very ancient times. The celebrated Arab writer, Ibn-el-Awam of Seville, recommended it in the 12th century. The advantage of this addition is not very apparent. The oil would be saponified by the alkali, the result being the same as the addition of a certain quantity of soap. This may possibly have a softening effect on the skin but it would not seem calculated to improve the flavour. These few extracts will give some idea of the great variety of dipping solutions in favour in different countries.

The Denia lexia being the one most widely known and popular it would probably be wisest to experiment on a fairly large scale only with the lye they use. It would probably prove more convenient to prepare it artificially by dissolving a certain quantity of caustic potash and carbonate of potash in water. Experiments are in progress to ascertain the proportion of these two substances which would be required to produce a lye similar to that made by the above formula.

SWEATING.

The raisins are progressively removed from the trays as they become sufficiently dry and are taken indoors. Sometimes they are stored in large esparto baskets but more usually they are spread out in an empty room, in a layer a couple of feet deep. In either case a certain amount of sweating takes place, which improves the fruit, equalizing the amount of moisture and softening the skins of any which may have been over dried. As a rule they do not remain long in this state; the grower usually loses as little time as possible before he takes his fruit into town for sale.

GRADING, PACKING, ETC.

The establishments where the raisins are graded and packed are known as Almacens de Pasas. They are run by the merchants or packers, who purchase the crude dried fruit from the growers. There are about twenty of them in Denia. That of Don Juan Morand, which I visited, is one of the largest. The crude raisins are brought into town by the Cosechero or grower, in carts or on pack mules, and hawked round among the different almacens until a sale has been effected. They are sold by the small quintal of 50 kilos. (nearly 1 cwt.), the price fluctuating considerably. At less than 3 douros (15 pesetas) per quintal it is considered that there is no profit for the grower. This would work out at 12s. per cwt. (at par).

In the almacens, all work is done by hand, men and women being employed at cheap rates. Men receive 10 reals = 2.50 pesetas per day, and find themselves. This would be equivalent to about 2s. per day of our money. Women are usually paid by contract. The operations performed in the almacens are separation from the stalks, grading and packing. Machines are not favoured for any of this work. I was

told that they injure the fruit. No doubt Spanish conservatism has something to do with this prejudice and, at the low rate of wages ruling, a change is not necessary. There is nevertheless no doubt that the removal of the stalks can be more completely and thoroughly performed by hand than by any machine.

The almacen I visited was a large two storied stone building, the ground floor of which was chiefly a series of store rooms for the cased fruit. It was on the first floor that the handling of the raisins was carried out. This floor was divided into three large, airy rooms with cement floors. The first of these was a store room about 80 ft. x 45 ft. into which the crude dry fruit is carried in large palm baskets known as capazos of a capacity of 2 arrobas each; one man carries two of these up the stairs at a time, a load of 1 cwt. of raisins. These are emptied out in a layer of from 3 to 4 ft. in depth over the whole floor. Adjoining this is the stemming room, also 80 ft. x 45 ft., in which the raisins are removed from the stalks. This work is performed by women, from 150 to 200 being employed at a time. Payment is by contract at the rate of 35 to 40 cents per arroba of about 28 lbs. A woman can stem 4 arrobos, = 1 cwt., per day, for which she would receive 1.40 to 1.60 pesetas equivalent to 1s. 2d. to 1s. 4d. of our money.

From the stemming room the raisins go to the grading room, which is a little smaller (60 ft. x 45 ft.). Here they are sorted out into different sizes by means of sieves or riddles of simple construction. These consist of a wooden hoop, about 2 ft. in diameter, across which is stretched a sheet of parchment punched with circular holes of sizes corresponding to the different grades. In one corner I observed a large hanging riddle of wood and metal, which had been discarded as it was considered to injure the fruit.

Packing is the final operation; the raisins are put up in cases of 7, 14 and 28 lbs. the last being the most usual size. The highest grade fruit is often put up in 7 lb. cases. The principal grades and last year's prices for them, C.I.F. London, were as follows:—

Extra Flor ...	... 38s. to 40s.	per cwt.
Flor ...	... 32s. to 35s.	,,
Superior Selected ...	28s. to 30s.	,,
Selected ...	. 23s. to 28s.	,,
Seedless ...	... 27s.	,,

For shipment to the Baltic, a cheap form of raisin is put up known in the trade as "off stalk." This term is rather a misnomer as it is only the large stalks which are removed the smaller fragments being left attached to the raisins. Sometimes high grade fruit is put up in this way but it is usually inferior to that which finds its way to England.

The raisin drying season commences in August, extending into September and even October. The earliest dried are lighter in colour but somewhat smaller than the September fruit which is looked upon as the best. The size has a good deal to do with value but the substance of the flesh is of equal if not greater importance. In appearance the chief difference between our raisins and those of Spain lies in the colour—theirs are redder and not so golden as ours.

* * * * *

The Denia raisin trade is almost entirely in English hands. The pudding raisin, though one of the necessaries of life in English speaking countries, and used to some extent in Germany and Scandinavia, is in very small demand in most other continental countries where puddings

are practically unknown. In Spain, as in France, the only form of raisin largely consumed is the dessert Malaga, which is, of course always eaten raw. One really needs to have resided in Latin countries to realize this radical difference from the customs of English speaking peoples. It is a feature which has a good deal of bearing on the Denia raisin industry, which has thus no home market for its produce but has to rely entirely on export, chiefly to London and Liverpool, but these raisins are also largely shipped to Canada, Germany and Baltic ports.

In this respect Spanish conditions differ absolutely from ours. In Australia it is the home market on which we rely and which our growers are making every effort to preserve, with the result that far higher returns are being obtained than would be possible in competition with outside prices. Don Juan Morand is not very hopeful as to the future. Faced as he is with the prospect of reconstitution on American stocks at an early date, this is not perhaps surprising, but he complains of other unsatisfactory features. The life of the vine, he says, is shorter than it used to be. After twenty years, even ungrafted vines seem to be worn out whereas in olden times they used to last for a century. Smaller yields are also complained of. Twenty arrobas per hanegada (not quite a ton and a half per acre) is now considered a good crop of raisins whereas in olden days 30, 35 and even 40 were common. He explains all this by saying that the land is tired of vines. Possibly insufficient manuring or the use of fertilizers not thoroughly suited to the soil, may be responsible for the trouble. In spite of all this, raisin production appears to be profitable in Spain for the average price of non-irrigable land, planted with raisin vines, is 80 douros per hanegada or a little over £90 per acre.

Don Juan referred on several occasions to Australian competition. To my query whether he did not rather fear that of California he pointed out that the increasing home demand of the United States is absorbing all the Californian raisins—so much so that last year a couple of thousand tons of Denia raisins were sold in New York in spite of the hostile tariff and freight charges amounting to 30s. per ton. Our Victorian raisins are becoming a frequent topic of conversation among Denia merchants, who view our recent shipments to London with a certain amount of alarm.

I had an interesting conversation with Mr. Alfred Rogers, an Englishman who has for many years been interested in the raisin business in this part of Spain. He knew something of Mildura shipments and had only recently been warned by a Liverpool friend that Australian raisins were likely to spoil the spring trade in the Denia article.

The raisin trade is most active, in England, about Christmas time when the new season's fruit arrives from Spain. Some stocks usually remain over from the December sales and the demand livens up for these in the English spring. Fresh Australians, arriving at this time of year, are naturally preferred to the 6 months old Denias. In this way our shipments, small though they were, had a disturbing effect on the trade and, according to Mr. Rogers, created a certain amount of alarm in English raisin circles.

VINE PRUNINGS AS FODDER.

F. de Castella, Government Viticulturist.

This subject, which was briefly referred to in the October number of the *Journal*, is dealt with in the "*Progres Agricole et Viticole*" of 20th September last, published at Montpellier, France, in an interesting article by M. Paul Héran, a few extracts from which may prove of interest.

The following analyses of vine prunings (canes and leaves) in different forms will give some idea of their high fodder value:—

——	In the Fresh State.	Dry.	Made into Ensilage.
Water	78.	13.0	58.68
Nitrogenous substances (protein) ...	3.10	12.28	3.93
Carbohydrates	11.98	47.17	18.09
Fats	0.51	2.0	1.70
Cellulose (crude fibre)	5.0	19.76	12.88
Ash	1.46	5.79	.

Vine pruning ensilage, reduced to the same state of dryness as hay, viz., 14 per cent. of moisture, compares as follows with meadow hay:—

	Vine pruning ensilage.	Hay (Wolf).
Nitrogenous substances	6.25	7.5
Fats	2.95	1.5
Carbohydrates	33.03	52.5
Cellulose	24.10	33.5
Ratio of fats to protein	1 to 2.12	1 to 5
Nutritive ratio	1 to 6.4	1 to 7.48

As M. Héran remarks, "One can see from these analyses and this comparison that ensilaged vine prunings can and should constitute good fodder." To obtain this result the most important point is the mechanical treatment they must receive for which purpose several makes of machine are obtainable in France which chaff, crush and disintegrate the prunings in a very thorough manner.

In order to make good ensilage, the vines should be pruned as soon after vintage as possible and before the leaves have fallen so that the proportion of moisture may be sufficient to enable fermentation to take place under normal conditions. After being reduced to a fine state of division in the machine alluded to the silo is filled and weighted at the rate of 1½ to 2 tons per square metre (10½ square feet). Fermentation takes place, raising the temperature to 113 deg. to 122 deg. F. which point should not be exceeded. As soon as it has cooled down the silage is fit for use.

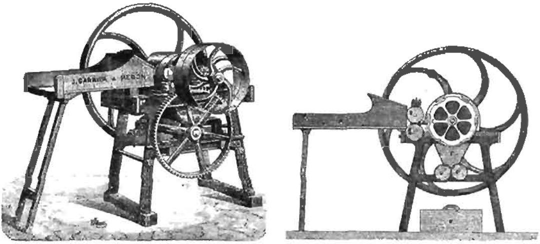
This form of fodder is beginning to be used in the viticultural regions of France and several large proprietors are mentioned who thus utilize their prunings on a large scale with excellent results. After a very little time cattle become used to it and eat it readily. Horses and mules require to be gradually accustomed to it, but after being broken in to its use for 3 or 4 days they may be fed on it exclusively though it is

more usually mixed with bran or some other fodder. The followin, is an example of the daily ration given to his working horses by one larg agriculturist:—

$4\frac{3}{4}$ lbs. beetroot leaves.
$2\frac{1}{2}$,, bran.
$3\frac{1}{2}$,, crushed barley.
22 to 26 lbs. vine ensilage.

A dairy is mentioned where for nearly 3 years the cows have bee exclusively fed on vine ensilage, the yield of milk being entirely satis factory and the health of the herd excellent.

The article deals with the cost of production which it is estimate would not in any case exceed 8s. per ton of ensilage including the prunin of the vines and cartage to the chaffer and crusher. The average viel of green prunings, immediately after vintage, in the south of Franc would be from 3 to 5 tons per acre. It must be remembered that i that district vines are planted at 5 x 5 feet. In Australia the viel would not be so high.



GARNIER'S VINE SHREDDER.

It is not only as fodder that this vineyard by-product is of value; dry vine prunings, chaffed and crushed by the same machine constitute excellent bedding, more absorbent than straw, and therefore capable of furnishing better manure. Several vinegrowers are already employing it in their stables.

The importance of this hitherto neglected by-product of viticulture is worthy of serious consideration in Australia. Its use in such a season as last year's would doubtless have saved many thousand head of stock from starvation. In vineyard districts where fodder is scarce its value is evident. Nothing is said in the article referred to as to the effect of such early pruning on the vine. No doubt total pruning before the leaves have fallen would be injurious as it would interfere with the accumulation of reserve materials by the vine. The removal of one half of the canes would probably do little harm and yet provide a very large quantity of fodder.

An illustration of Garnier's machine for treating vine prunings is reproduced, showing a general view and also a section. In the latter, the arrangement of the six cutting knives, on a horizontal drum, is shown.

STUD MERINO EWES.

H. W. Ham, Sheep Expert.

Through the months of November, December, and January merino breeders have occasionally to go through their stud ewes and clean eyes and tails. To cut the wool away from the eyes during the time the grass is seeding is a necessity, but it is of greater importance that the tail parts be cleaned. Often ewes cannot be served by the ram through this.

As soon as a stud flock is worked up to be of any merit and fair length of staple, and fair density and good body covering is reached, then more or less tail and head covering comes along with it. The better and more high class a flock of merino sheep becomes, the more attention is needed. No matter what a breeder's aim may be, sheep will always vary; some become excessively covered and others too bare pointed and thin. Bare legged and bare faced sheep are usually thin and wasty below and not filled up very well with wool under and about the tail. These give less fly-blow troubles than the better covered class.

Stud ewes should be cleaned well about the tail, and burrs, &c., removed from under the rams to give them the final chance at this time of year to serve the ewes well. Burrs, both around a ram's pizzle, and over the tails of ewes, conduce to make the ram sore, for he ineffectually serves the ewes many times owing to them being excessively woolled. Some ewes will be found with the nipple cut off, the result of careless shearing. It nearly always contracts somewhat in healing and this makes it harder for the ram to serve quickly. Often ewes are closed up like mares, but this can be rectified at times by similar treatment to that prescribed for mares.

There is also a scald caused by a black gummy substance on many stud ewes that is very sensitive and sore. It is worse some seasons than others. Ewes will not carry a heavy ram for more than a few seconds as this scald is very painful. The wool and folds are pressed on it by the ram's weight and if a ram is (as a stud ram usually is) thick set and heavy, and consequently slow of service, then very few ewes get in lamb. For scald there is nothing to equal three or four of the leading sheep dip powders, at a strength of one pint of powder to five gallons of water and kept well stirred. Put the ewe on her side, cross the hind legs, holding the bottom leg across behind the hocks of the topmost leg and mop the dip water on with a cloth. The water will evaporate, leaving the powder adhering to the skin and wool and its action is then to dry up the scald. It will also, after three or four applications, begin to turn the folds and loose skin a dark colour, and later on, come right away. When shearing the wool and dirt away, care should be taken that no very severe shear cuts are made, as the action of the powder dips, if the strong sediment that settles in the bottom of the liquid be put on, is likely to be too severe and a few ewes may be lost if carelessly treated.

In stud weaner ewes the scald is always getting flyblown. If it is dried up, and the folds removed, the cause of flyblow in this class of sheep disappears. Maggots cannot live and thrive if they come in contact with powder dip provided it is of fair strength. Applying spirits of tar, sprinkled out of a bottle with a hole in the cork, or from a scent bottle with an adjustable top, is the best way to immediately kill the maggots, and this method is adopted by the best Tasmanian breeders; it is instant death to the maggots, is very searching, does not take the wool off nor discolour it.

With flock ewes the method mentioned in the *Sydney Wool and Stock Journal* by Mr. H. H. Kelly of Garriwilla Station, Gunnedah, N.S.W., is to be commended for speed and for being effectual. His plan is to have a trough made of any length to suit the number of sheep to be treated and the number of men employed and to sit the ewes in a mixture of sheep dip, at a strength according to the degree of damage the flies are doing. In some districts, twice the strength of ordinary dipping may be found necessary, but some classes of sheep are worse than others. Where sweating is caused by folds meeting, these parts will need to be hand dressed with a stronger mixture. In a few cases the skin will crack and the flies may leave the maggots in these cracks, but they never develop to any size. It is only when the sediment from the bottom of the tin is put on that this cracking happens.

In many stud ewe lambs the growth of wool over the head forces the eyelids in, and these ingrowing eyelids cause great irritation and pain; in ram lambs the horns lessen the pressure of wool over the eyes. A small piece of skin immediately above and below the eyelashes can be cut out, and the gap made by this means, when healing together, will draw the eyelashes out, causing the irritation to cease. Complaints regarding ingrowing eyelids are much more prevalent than many breeders are aware of.

Ingrowing eyelids, scald, and wool blindness, if not attended to, will prevent stud weaner ewes from thriving, no matter how one may study constitution and feed them. The narrow made, short stapled, excessively yolky type of sheep are not worth this trouble, as they are not stud sheep in any sense, and are a very unsuitable type in the general flocks. They are bred in flocks where weight per head is made the desired aim, although they will occasionally come in any stud.

SPRING SOWN RAPE.

H. W. Ham, Sheep Expert.

Spring sown rape cannot be advocated for general lamb-raising purposes. It is the early sown April rape, mixed with oats and allowed to grow to a heavy bulk of feed till about August, that turns off the surprising numbers of lambs and ewes.

Even in good rainfall areas all soils are not exactly suitable for successful summer rape growing. Any soils that set hard will retard the growth of roots, preventing them striking out sufficiently far to gather moisture. If it is the nature of the ground to harden and crack, it is no use for profitable summer rape growing. Of course, in many instances, even on cement-like soil or on cold so-called crab holey country, it pays to grow rape, not so much for the profit to be made from sheep or lambs, as for the change and consequent good it does the soil. The objection many farmers have to spring sown rape is that they have to plough the land the second time, and this makes them late getting their crops in. It certainly is an advantage to have a good portion of bare fallow, as it can be kept worked ready to sow immediately after the first rains in March. With ground that is at all liable to set and where early sowing is necessary, a bare fallow to allow of early working is, generally speaking, the wisest. On loose buck-shot country, if it has been ploughed well in the winter, a

crop of rape can be grown and fed off, and in many cases a strong cultivator will bring the ground into good order for sowing, especially if the sheep have been removed whenever the ground was at all wet.

New fallow land is not nearly so good for spring rape as older ground. In the first place it is never sufficiently fine for the small rape seed to germinate in, and it gets more or less sunbaked, especially if ploughed when very wet. It is cheaper to let the sun and moisture do the work of breaking it down for the March sowing, than to attempt to work it up in time to sow rape. Rape on sunbaked new fallow does not get its roots away at the same rate as in older cultivation ground.

Old ground with the stubbles ploughed in will hold the moisture longer after each shower, and even in ground bad to set, straw assists towards checking this setting.

As growth must be made in a short space of time, all spring sown rape should be sown with superphosphate.

Rape sown in late spring does not go to seed to anything like the extent winter sown rape does.

In country like the Western District plains, possessing a fair rainfall and a good chance of thunderstorms through the summer, a fair amount of picking can often be expected right through the summer, especially on buck-shot country. On suitable parts of fallow that are of such a nature as to retain moisture and, at the same time, allow of free root growth, rape is being found very profitable when the right breeds of store lambs are bought at prices allowing a margin. As this branch of farming grows, it will be possible for the freezing works to procure enough to warrant continuing operations further into the summer than has been the case in the past. Lambs from roomy merino ewes, by good shaped Lincoln or Leicester rams, or, better still, lambs by good Down's rams from coarse ewes, will suit this demand best. When the system of rape fallow is more generally understood there will be no need to sell the above breeds of lambs to freezing companies at seven to eight shillings, now too often the case in the rush from the northern areas, hastened by the short spring there.

Farmers who have a fair area of buck-shot fallow into rape will do well to buy lambs of the right breeds at about eight shillings, either in the wool or shorn. Those who have room to graze them until the stubbles and rape fallow are ready can buy to the best advantage.

Lambs from either of the two crosses named, if carefully bred (for there are lambs of these crosses that are only second raters), will shear bulky fleeces, worth about three shillings. After being shorn, lambs would cost the farmer this year about six shillings only, and being of a fleshy breed they will fatten easily by end of January or beginning of February. Merino, and fine comeback lambs will not suit the farmer for his purposes, as they are slow to thrive and cannot be made thick fleshed enough to please the export trade. Apart from the profit to be made directly from fattening of lambs there must be credited the advantages that rape fallow gives to the soil for the following grain crop. A good crop is a certainty after sheep and rape, even if sown late.

Lambs affected with tape worms need not be passed by when a supply of rape is available. Rape is better than any drenches for clearing lambs of stomach and intestinal worms, and even lung worm, unless they have gone too far.

Equally with the buying of the right sort of lambs at the right prices, fodder growing is largely a matter of judgment and good management. Thorough methods are as much a necessity in growing spring fodder crops as for grain growing.

THE PROBLEM OF OUR UNPRODUCTIVE LANDS.

T. Cherry, M.D., M.S., Director of Agriculture.

THE NECESSITY FOR SCIENTIFIC FARMING.

There is no doubt but that the problem of the utilization of our unproductive lands is of the greatest importance at the present moment. Nearly all the remaining Crown lands are, in their natural condition, of much lower value than those already alienated. Yet it is on these lands that we must look for a great proportion of the new settlement in the immediate future. In addition, a great deal of the redgum and box country which has already been taken up—country which carries perhaps a sheep to the acre on the natural grasses—is susceptible of rapid improvement when proper methods are adopted.

The total area of these lands in Victoria is very considerable, comprising, first, approximately 4 million acres of the inferior and poor parts of the Mallee; second, at least double that area of hilly country forming the main part of the great Dividing Range and its northern and southern spurs; and third, perhaps three million acres of the sandy land along the coast. The total area is at least one-fourth of the entire extent of Victoria. The quality of this land of course varies, but it is all characterized by producing little vegetation of food value in its natural state, and when cleared, the scrub and native plants show a great tendency to re-establish themselves. In the coastal areas the timber is mostly stunted stringybark and peppermint with scrubs of dwarf sheoak and grevillias. Grass trees are not uncommon, and the smaller plants are largely heaths and cutting grass. In the Mallee, a dwarf variety of this eucalypt grows in much of this area, heath and grass trees are also found, and the place of the cutting grass of the South is gradually taken by spinifex or porcupine grass.

The hill country comprises most of the slopes and upper parts of the hills, consisting of slaty or granite formation, with considerable quantities of quartz and hard sandstone rock. In the soil, which is usually covered by a small variety of ironbark, stringybark and peppermint, the essential plant foods exist in considerable quantities, but the difficulty is that they are for the most part found in forms that are unavailable for the plant. That is, some change must take place before they can be utilized by the plant as food. On such poor lands one characteristic of Australian soils is exaggerated—namely that there is very little difference between the surface soil and the subsoil. Another fact which has been brought into prominence by the work of the Department of Agriculture, is the fact that such soils rarely require anything except phosphoric acid to be added in the form of artificial manures. Nitrogen is generally fairly abundant, while it is very easy to rapidly increase the amount by growing peas, clover, lucerne, and similar leguminous plants and by adding to the soil the residues of each year's crops after they have served as food for farm animals. In other words it is essential on such soils to feed all the produce to live stock, and the profit must come not directly from the crop but indirectly from the animal. Potash is very abundant in the Mallee, and present in large quantities in all the clays that are derived from the decomposition of the gold-fields slates and granites. Sufficient is generally available for all the requirements of ordinary crops, but it is now a well-established fact that any additional amount may be set free by the action

of the bacteria existing within the manure of the animal. It will thus be seen that under the existing conditions of Victorian climatic influences it is certain that farming may be carried on profitably and the fertility of the land be steadily increased as far as these two essential ingredients are concerned.

In regard to phosphoric acid, this is the plant food whose absence gives the character to the vegetation on the poor lands. It is present in very small amounts—amounts so small that from chemical analysis alone much of our soil would be classed by European and American standards as very close to the point of inefficiency. Moreover there is very little difference in the amounts found in the surface soil and the subsoil; frequently in fact if clay is met with a few feet below the sandy surface the percentage of phosphoric acid at once undergoes a marked increase. I am inclined to think that its peculiarity of the practical identity of the surface and the subsoil is a character which marks off Australian soils from those of the old world, just as clearly as the prevailing characteristics of our plants and animals. Very probably indeed all three are associated, and because our plants and animals retained the type of those of the mesozoic geological ages in the other continents, our surface soils have failed to become progressively richer with regard to phosphoric acid. Perhaps our climate has had its share in the want of development, but whatever may be the cause, of the fact itself there can be no question or dispute.

The Plant Food Available in the Soil.

An examination of these soils indicates that while they differ somewhat from one another, they all have the same characteristics. In the coastal plain, the prominent features are the variations in the amount of nitrogen and potash. In the case of nitrogen the amount varies chiefly in consequence of the character of the vegetation. Many of these plains are very wet in winter; the rank vegetation therefore gives them many of the characteristics of peaty land. The surface is occupied by a dense fibrous network of roots, extending for 6 to 12 inches below the surface. The amount of organic matter consequently makes these soils very rich in nitrogen. When they are turned up with the disc plough, exposed to the atmosphere and allowed to sweeten, the whole surface breaks down into a rich sandy loam. This type is seen in the best parts of the Portland heath land, the Heytesbury grass tree plains, the market garden areas near Brighton and Mordialloc and much of the plain country in South Gippsland. The quantity of potash varies chiefly in relation to the nearness of the clay. Many of the sandy loams rest on the clay at a distance of from 1 to 3 feet from the surface. In such cases the amount of the potash is relatively large. In other cases, however, the sand is interspersed with coarse grains of quartz or with ironstone, and the clay may be several feet below the surface; in such cases the amount of potash is comparatively low. With regard to phosphoric acid, the amount present appears to depend on the proximity of the clay subsoil. In many cases it is fairly large and the quantity is increased in the alluvial drift which is found at the foot of the undulating hills and rises which are often met within Southern Victoria.

In the hill country these soils are characterized by the relative amount of potash and phosphoric acid which they contain and by their comparative poorness in nitrogen, except in the alluvial soil at the bottom of the gullies. On the hill sides the phosphoric acid usually runs from forty to

eighty parts per 100,000; that is approximately the same amount as is found in the yellow slaty rock which forms the basis of many of the hills. The potash is nearly always high, this again being a characteristic with both the slate and the granitic rock. Nitrogen is comparatively poor, but owing to the relative abundance of the other plant foods, it is very easy to make up the deficiency by the growth of the leguminous plants.

In the Mallee the prevailing characteristics are modified by two conditions—the dryness of the climate and the extent to which the light sandy soil drifts with the wind. On the better class of soil we find that the concentration of plant food characteristic of dry regions is present. Consequently the Mallee soils respond in a wonderful manner to every shower of rain or application of irrigation water. The nitrogen is in a chemical condition very readily available for plant food. The potash is nearly always present in great abundance. Lime is also a prominent constituent of the soil, in many cases running up to as much as from 10 to 25 per cent. of the total weight of the soil. In the Mallee then the deficiency of phosphoric acid is much more marked than in the hill country or even in the greater part of the plain. Consequently the chief problem in the Mallee is a question of supplying phosphoric acid in easily available form and of having the necessary amount of moisture available. To put the matter in a tabular form the results of average composition of these soils work out as under:—

RESULTS OF ANALYSES OF VICTORIAN SOILS.

—	Nitrogen.	Phosphoric Acid.	Potash.
Rich Western District land ...	250	150	300
Average Northern Wheat land	110	65	300
Average Coastal Plain land ...	40 to 350	10 to 100	10 to 150
Average Hill soils	25 to 150	40 to 80	1 0 to 300
Average Mallee soils ...	25 to 2.0	5 to 100	200 to 1000

Such figures convey comparatively little information to a farmer, except so far as they compare with the average of Victorian soils. Without entering too much into theory, however, it may be said that the surface foot of an acre of land weighs approximately 2,000 short tons; that 10 parts of one of the constituents, say phosphoric acid, to the 100,000 represents a total weight of 400 lbs. per acre foot; that when a farmer sows 1 cwt. of superphosphate with his crop he adds approximately 20 lbs. weight of phosphoric acid per acre or only .5 parts per hundred thousand. The well known results of the addition of 1 cwt. of super. per acre indicate the enormous influence of such a trifling amount upon the growth of the plants, and it will therefore be seen that where our soils contain from 0 to 100 parts of these constituents per 100,000 there is ample room for xtensive realization in this respect. To put the matter in another way, 0 tons of farm-yard manure to the acre means on the average an addition f over 2 cwt. of nitrogen, 1 cwt. of phosphoric acid and 2 cwt. of potash er acre. This amount means the addition of 6 parts nitrogen and potash nd 3 parts of phosphoric acid per hundred thousand. In other words arket garden land which has been steadily manured at the above rate for 0 years has had a sufficient amount of plant food put into the surface ot of the soil to completely change the poorest sand to rich agricultural am.

ANALYSES OF SOILS.

Locality.	Soil.				Subsoil.			
	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Footslopes of Grampians	66	20	29	66	66	23	54	40
″ ″	73	20	45	61	44	21	37	20
″ ″	55	33	41	78	33	19	33	68
″ (Valley soil)	193	123	98	173	196	121	188	100
Ararat ...	81	43	450	144	...	...	...	...
″	154	21	48	134	115	18	54	84
″	93	49	183	152	73	49	139	132
″	148	80	346	200	56	36	269	160
Wyuna, Plain	71	52	251	134	64	52	609	190
″ Timber ...	96	66	459	174	88	68	1,080	182
Edi	81	70	14	126	28	20	29	110
Colbinabbin	56	80	160	110	[illegible]	70	360	120
Moormbool Forest ...	179	57	431	120	110	38	422	130
Dandenong	110	16	38	58	20	13	37	36
Werribee Sewage Farm original soil ..	126	45	154	60	95	64	457	230
Werribee Sewage Farm 11 years' sewage ...	171	53	299	170	109	77	343	230
Fern Tree Gully ...	389	102	167	540	252	127	104	300
Kinglake ...	152	41	116	178	...	...	...	...
Croydon	120	39	139	161		...	...	...
Toorak	372	45	182	52	85	5	98	101
Springvale . ..	37	10	19	64	26	10	18	78
″ . ..	68	11	17	92	18	6	16	48
″	43	13	18	176	39	10	17	158
Rosedale	61	17	109	80	37	10	121	32
″ clay subsoil 4ft.	...	..	...	..	25	37	59	22
″ gravelly soil ..	290	16	149	64	50	8	27	22
″ sandy ..	67	8	131	64	41	5	27	30
″ red gum flat ...	..	...	...	..	44	13	25	28
Trawalla	210	61	94	122	78	45	48	48
″	93	25	64	136	70	28	50	152
Comlab	162	28	47	150	39	14	29	36
Moolap	[illegible]	38	277	488	100	19	795	352
″	210	20	141	292	140	19	498	992
Geelong	150	24	78	244	120	20	332	348
″	90	15	93	104	90	19	303	134
Irrewarra	176	65	349	144	101	98	425	180
Yeo	269	44	39	154	146	21	21	144
Cobden	204	24	157	208	143	15	55	214
Loch	266	53	127	220	112	35	42	120
Leongatha	241	14	195	320	106	40	197	100
Mallee, Kow Plains ...	77	26	498	11,420	32	17	661	12,250
″ heavy Mallee scrub ...	81	36	612	380	62	34	772	1,370
″ pine country ...	75	22	253	226	42	29	346	600
″ porcupine ridge	43	12	191	164	49	18	478	1,300
″ Pinnaroo, S. Aus.	85	22	480	1,330	...	...	...	...
″ ″ ″	87	25	530	2,280	...	...	...	...
″ ″ ″	21	13	430	10,900	...	...	...	...
″ ″ ″	83	46	170	3,210	...	...	...	...
″ Port Lincoln ″	87	19	96	110	87	9	181	110
″ ″ ″	276	80	332	798	...	...	...	...
″ ″ ″	69	7	12	168	35	5	29	140

Solution of the Problem.

The utilization of the Mallee must be looked upon as a separate problem owing to the fact that the extent to which it can be made use of profitably is dependent upon the rainfall. Where the rainfall is over 15 inches or where water can be supplied for irrigation, all Mallee soils respond in a most satisfactory way to treatment. On the coastal plain and in the hill lands the rainfall is ample, in some places too copious, and the problem becomes somewhat more complicated. In the first place drainage must always be looked to. Much of the poor grass tree plain country requires draining before anything can be done to it. On the average the question of clearing the timber and scrub is not a formidable one. The ploughing of the surface, however, has been one of the great obstacles to the profitable utilization of this country in the past. The introduction of steam ploughing and the stump jump disc plough has, however, put an entirely new complexion on the matter, and it may be safely stated that no land in Victoria which is not too steep to carry an engine presents any great obstacles in the way of being brought readily under the plough. So much for the mechanical difficulties of ploughing and draining. In the general management of farms on such land the great fact which I wish to emphasize is that grazing does comparatively little to ameliorate the condition of the soil while cultivation rapidly causes it to assume an entirely new character. Three unanswerable reasons may be given why large areas of every farm on such land should be continually under cultivation :—

1. In the old days the peculiar value of phosphatic manures on Victorian soils was not known; consequently such lands became easily exhausted and we were not able to lay down with certainty the conditions requiring to be fulfilled in order to maintain and increase their fertility. Artificial manures used were usually nitrogenous in character, the most expensive kind to purchase and the sort which themselves produce the least effect upon such land. Consequently large areas after being cropped for a year or two were allowed to go back to the state of nature. The experience and the experiments of the last 10 years have clearly demonstrated that with the judicious use of phosphatic manures the fertility of this land can not only be maintained but rapidly increased.
2. Ten years ago it was a well known fact that the keeping of live stock on the farm tended to maintain and increase its fertility. The full explanation of this fact was, however, unknown. Researches carried out during the last few years have demonstrated the peculiar functions of the manure of all kinds of animals not only in enriching the land but also in setting free the stored up plant food of the soil and in increasing its water holding capacity. In other words, farm-yard manure not only supplies the crop with plant food but it also carries with it something which enables the growing crop to draw upon the locked-up plant food originally present in the soil. We are not therefore dealing with theory. The scientific fact is clearly proved as any fact of science when we state that by means of cultivation, the use of phosphatic manures, the feeding of the produce

to animals will inevitably lead to a steady increase in the fertility of the land. So much for theory. To indicate the extent to which this theory is borne out by practical results I would refer to a few well-known localities. Much of the market garden area near Melbourne—the land lying between Dandenong, Brighton and Cheltenham is representative of the poorer parts of the sandy coastal plain. Specimens taken from virgin paddocks indicate that all three constituents of plant food are very low, yet this land is being readily sold at an average of £10 per acre, and converted into market gardens. The market gardeners make a success of it by carting loads of stable manure and by using 4 or 5 cwt. of bone-dust or superphosphate to the acre. There is therefore ample proof that the transformation is easily brought about. The question is whether it will pay for the ordinary farmer to attempt to do it. We shall see this a little later on.

To the south of Geelong there are large areas of the cutting grass country representative of an immense portion of the 3,000,000 acres in the south of Victoria. In the old days it carried a sheep to four or five acres. Since the advent of the disc plough and phosphatic manures it has been brought under cultivation chiefly for crops of hay. The farm-yard manure is furnished by the grazing of sheep on the stubble, and in some cases grazing down the crop during the winter months. The fact that large areas of this land are being leased at from 6s. to 8s. per acre per annum is an indication of what can be done by such methods.

3. All through the coastal area of the hilly country we meet with flourishing orchards. Sometimes specially good spots are selected, but on the other hand in many cases the top of a sandy ridge is occupied by the fruit trees. Such orchards often have peas or other leguminous plants grown as winter crops to be ploughed in early in spring. The market price of orchard land of this character in the neighbourhood of Doncaster is sufficiently proved to show that the venture has turned out a practical success.

It will be seen from the foregoing examples that in many cases the reclamation of the poorer lands in Victoria has already been successfully accomplished. It may be argued that the market gardeners who have made a most conspicuous success of this method have merely been transporting the fertility from the Melbourne stables on to the land. This is certainly true, but it must be remembered that the same end may be obtained by grazing off with sheep or by working the holding as a dairy farm. Naturally the climatic conditions are more favorable for sheep in the northern parts of Victoria and for dairy farming in the southern. In the case of sheep, the land is brought under cultivation and the first crop grown with the assistance of superphosphate. Wheat, oats, rape and peas can all be grown in areas where the rainfall is 20 inches or upwards. In the course of a few years part of the farm may be laid down to lucerne in many localities, while there are a number of successful examples throughout all the wheat-growing areas of the adoption of a rotation system of crop, grazing and fallow with the substitution, to some extent at least, of a green fallow of rape over a portion of the bare fallow usually adopted.

In the southern districts where the rainfall is 30 inches or over, dairy farming is the most suitable form of industry for the soils which we have been considering. The cultivation should regularly include peas with either barley or oats, or better still a mixture of peas, beans, barley and oats sown early in autumn as a green fodder crop. On the same paddock a crop of maize or of one of the sorghums can be grown in the summer. Half of the main portion of the cultivation each year should be devoted to oats and the other half to peas, and these crops grown alternately. The effect of this rotation of peas and oats, combined with the steady application of 1 cwt. superphosphate to the acre, and a few loads of farm-yard manure in addition, is simply marvellous. The soil is exposed to the sweetening influence of the sun and air, the fertility is increased by the peas and the regular ploughing in of the stubble very rapidly improves the tilth and general condition of the soil. Smaller areas of a dairy farm may be planted with potatoes, mangolds, cabbages and pumpkins, all of which crops are valuable not only for keeping up the supply of milk on the farm but also through the large amount of manure which they produce and which directly or indirectly becomes incorporated with the soil.

The transforming influence of organic matter on the soils we have been considering is very well exemplified in the vicinity of every dwelling house. A back yard rapidly becomes an oasis in the desert. It matters not how poor the soil originally was, whether the gravel and clays of the goldfields or the sand dunes near the sea shore, the fact very speedily becomes apparent. A little attention soon produces a garden where flowers, vegetables or fruit trees flourish in accordance with the skill and taste of the owner. If the back yard is simply allowed to look after itself marsh mallows, nettles, Cape weed and a dozen similar plants speedily flourish in rank luxuriance. It must be remembered that Australia is still in the pioneer stage of settlement. In Europe and Asia the land has been in continuous occupation by civilized men for thousands of years. Large tracts have therefore been transformed practically into continuous areas of garden soil. There is nothing new or mysterious about the methods adopted. The great reason why we may go forward with absolute certainty of success is that we are following on the lines tested by experience ever since civilization began. We have full assurance of continuous success on account of the facility with which we can bring large areas under cultivation, and the remunerative returns obtainable from such cultivated land. At the same time the knowledge of phosphatic manures enables us to overcome the first obstacles at a jump instead of laboriously working round them as our forefathers did in former centuries.

Confirmation by this Season's Results.

The fact that the above views are borne out by practical experience has received a very striking confirmation by the results of the harvest which has just been gathered. In almost every district cultivation is being steadily pushed in the direction of the poorer lands. The past season has been less favorable than the average, the long spell of dry weather in the spring being against a heavy yield of hay. Yet the results of the cultivation of poor land combined with the use of phosphatic manures have in nearly every case exceeded the expectations of the farmers. In quite a number of cases the remark has been made that the poor land has scored this season all right. As specific instances may be mentioned the country between Mount Duneed and the sea coast to the south of Geelong, the goldfields clay country in the neighbourhood of Ballarat,

inferior "buckshot" volcanic country at Monegatta near Romsey, and the sandy coast lands not only round Brighton, Spring Vale and Dandenong, but also to the south of Leongatha and other portions of Gippsland.

On these areas oaten hay has been the chief crop. Generally from ¾ to 1 cwt. of superphosphate has been drilled in with the seed. In many cases the resulting crop of hay has been over two tons to the acre. Everywhere, the remark has been current that the effect of the phosphates on poor land is much more marked than on rich agricultural soil. The experience of former years has not only been confirmed but the fact that many of the areas tried this year were chosen deliberately because they were below the average of fertility has made the results appear still more striking. What I have described above as the first step on the up grade has thus been accomplished. In many cases the ploughing in of the stubble and the more thorough working of the land will insure a better crop next year, but there is no doubt that after one or two crops of oats the introduction of peas has a markedly beneficial effect on all the poorer classes of soils. If to this be added the farm yard manure which is produced by the consumption of the hay crop harvested this season the system necessary to continue the progressive development of these soils will be in full working order.

Improvement in the Mechanical Condition of the Soils.

Very striking evidence is accumulating as to the importance of "tilth" as a measure of the productivity of these soils. Two instances may be cited. On the Mount Xavier farm, Ballarat, the soil is a stiff silurian clay in many parts denuded of what little surface soil which once existed. The surface had been partly carted away to enrich the surburban gardens in the neighbourhood and partly had been worn away by the old cart tracks which traversed the slopes of the hill in all directions. The conditions under which this farm was taken in hand were therefore as unpromising as possible. Several large heaps of material from abandoned shafts remained from the early days of the goldfields. The slate and sandstone which had thus been brought to the surface had to a large extent weathered down to a coarse sand consisting of grains of quartz and other hard rocks. Such quantities of this material as were not used in filling up the abandoned shafts were scattered on the clay land in the neighbourhood and incorporated with the surface soil by ploughing and cross ploughing. On such portions the crop of oaten hay was decidedly heavier than on the average of the 50 acres. The improvement in the mechanical condition has been very marked. A similar state of affairs has been brought about by three seasons' work in the experimental farm on the Heytesbury grass-tree country. Originally the surface soil was so permeated by the roots of the dwarf scrub, heath and bushes that, when the ground was first broken up, an immense quantity of the larger sized roots (averaging perhaps an inch in diameter) had to be picked out by hand. The smaller roots have now rotted and become incorporated in the surface loam. The result has been two-fold. Not only have the crops steadily improved but the labour of working the land and the finish which it was possible to obtain by ordinary implements has improved year by year. It will be seen therefore that evidence is readily available, both in the experimental work carried out by the Department and in the results obtained by the more enterprising class of farmers, that the problem of the profitable utilization of such soils is practically solved.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page 721, Vol. VI.*).

XVII.—Reproduction.

In all vertebrates, except the degenerate sea-squirts, reproduction takes place sexually, that is to say each individual arises by the union of a cell called a sperm cell or SPERMATOZOON derived from the male, with a cell called an OVUM derived from the female. In Chapter II. it was shown that every higher animal and plant is built up of cells each of which contains a nucleus. Now in every nucleus there are present a number of structures like short pieces of microscopic twine called chromosomes (see Fig. 9). The number of chromosomes in each body cell is constant for the members of a particular species. Thus in some snails there are 32; in the mouse, trout, and lily there are 24; in the ox, guinea-pig, man, and the onion there are 16. Now it is found that in the spermatozoon and also in the ovum the number of chromosomes is exactly one half that in each of the body cells; when therefore these two cells fuse together in what is called the fertilization of the ovum the correct number of chromosomes—and therefore an efficient cell—is produced. There is some reason to believe that the chromosomes are those structures which are responsible for the transmission of ancestral characters to the offspring.

The spermatozoa arise in two testes or testicles. Each spermatozoon is composed of a head, a neck and a tail, the last mentioned part keeping up a constant side to side or wriggling movement, so that the spermatozoon can move spontaneously and is thus able to travel several inches or even a few feet on a moist surface before exhaustion sets in. The spermatozoa are microscopic in size, being about $\frac{1}{500}$ inch long for most of the larger mammals. The spermatozoa floating in an albuminous fluid pass from each testicle through a highly convoluted tube and then through a straight tube close to the neck of the bladder where in most mammals a SEMINAL VESICLE or reservoir is found. In the sexual act the secretion of the testicle is mixed with the secretion of other glands such as the prostate, and the mixed fluid or SEMEN is ejaculated through the urethra to the end of the penis and thence into the vagina or uterus of the female. The number of spermatozoa injected in a single insemination is very large being expressed as hundreds of millions for most mammals. When the semen arrives in the vagina or uterus the powerful tail movement of each spermatozoon urges it forward, the direction being always the same and probably determined by a chemical substance which is present in the moisture of the genital passages of the female and which increases in strength from without inwards. What may now be described as a race takes place. The spermatozoa travel through the uterus and up the Fallopian tubes attached to the uterus. Should an ovum be present in the upper part of a Fallopian tube, or even at the beginning of this tube in the abdominal cavity, the first spermatozoon to arrive enters it and fertilizes it and immediately the ovum alters its outer layer or tunic so that no more spermatozoa can enter. (Fig. 62.) There is probably here a provision of nature for selecting the most vigorous spermatozoon in somewhat the same way that the queen bee selects the most vigorous drone during her nuptial flight.

The cells that give rise to spermatozoa in the testes are laid aside for this purpose at a very early stage of development—long before birth—but they do not become active until puberty which takes place at an age varying with each species. The production of spermatozoa is not the only function that the testes carry out; these two glands are undoubtedly the seat of formation of chemical messengers or hormones which pass into the blood stream and influence most regions of the body. At puberty, beside sexual power and desire, a number of secondary characters occur in the male such as changes in the vocal chords and larynx giving the broken voice, increased growth of hair, increased muscular, mental and emotional activity, &c., which are referable to hormones derived from the testes. If an animal be castrated before puberty these secondary sexual characters do not appear: in such an animal however development of these missing characters can be stimulated by grafting a testis from a male of the same species somewhere in the body.

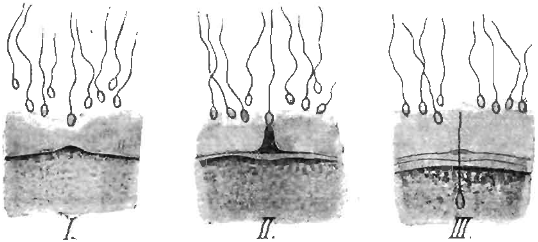


Fig. 62. Fertilization of an Ovum, Highly Magnified.—I. A number of spermatozoa have reached the border of the ovum. An alteration in the tunic of the ovum takes place opposite the foremost spermatozoon. II. and III. Stages in the entry of the foremost spermatozoon; the others are refused admittance. (After Hagemann.)

The ova are formed in the two glands of the female called ovaries. The cells from which the ova arise are already laid aside in the mammal long before birth, but do not become active until puberty is reached. After this age until sexual activity ceases, a process of ripening of the ova can be observed in each ovary. (Fig. 63.) From time to time an ovum sinks in the ovarian tissue and gets enclosed in a hollow sphere of cells or FOLLICLE containing a fluid; this sphere gradually works to the edge of the ovary and then bursts, liberating the ovum into the abdominal cavity. This process, ovulation as it is called, will occur if access is denied to the male but though not entirely dependent upon the sexual cycle it is hastened both by the state of the genitalia in the period of œstrus or sexual desire and by copulation with the male. The ovum in the abdominal cavity in some manner not thoroughly understood is carried (possibly in a purely passive way by the writhing of the pelvic gut) to the mouth of one of the two Fallopian tubes. It is then apparently seized by the tentacular mouth of the tube and driven slowly towards the uterus by peristalsis. Should no spermatozoon be present the ovum passes through the uterus and thence into the vagina and so is discarded. But should a spermatozoon enter into the ovum fertilization will occur. When the spermatozoon bores into the

ovum its tail drops off but the head and neck parts enter and blend wi the nucleus of the ovum. When fertilization occurs the ovum at on begins to change. It divides into two, then into four, and so on, eac daughter cell growing at the expense of nutriment derived from the mucou membrane of the tube. In this process of division it is interesting to no that each daughter cell has the same number of chromosomes as the origin. fertilized cell; for by a process of division, like the splitting of a ca longitudinally, each of the chromosomes of the mother cell divides into tw making a complete set for each cell, and each of the daughter chrom somes can divide longitudinally and so on. Thus it is that in every cell c the adult body the chromosomes are derived half from the mother and ha from the father. The mass of cells to which the ovum has given rise pass down the Fallopian tube into the uterus and there lodges becoming firml adherent to the uterine wall. Its further development will be considere later. In the mammal an ovum is utterly incapable of developing unle fertilized by a spermatozoon, and the spermatozoon must emanate from male of its own species or at least of species very closely akin. Thus su cessful pairing can occur between hare and rabbit, but not between ha or rabbit and dog.

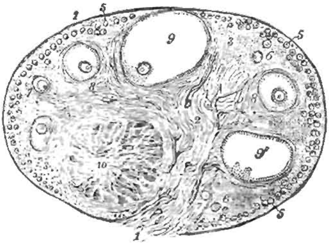


Fig. 63. Section of the Ovary of a Cat.—1, outer capsule; 5, cells from which ov arise; 6, similar cells enlarging and sinking deeper, and ultimately forming follicles 7 and 8, unripe follicles; 9, ripe follicle, about to burst and shed ovum; 10, corpu luteum. (After Schrön.)

In the female, as in the male, secondary sexual characters are dependen on hormones emanating from the active ovaries. If the ovaries ar removed before puberty these secondary sexual characters will not appea but they can be induced by grafting into some organ of the body (say the kidney) the ovary of a female of the same species. The ovary can als through its hormones produce a number of significant changes in the body. Thus the sexual cycle in the female, the growth of the mammary gland, the regulation of the amount of fat in the body, the changes in the uterus during pregnancy, and even the continued existence of the uterus itself are due to chemical messengers arising from this important organ.

The ova in a mammal are microscopic in size, being about $\frac{1}{150}$ inch in man, whereas in the bird the ovum is enormously swollen by a supply of food for the embryo called the yolk.

THE SEXUAL CYCLE IN THE FEMALE.

In all female mammals after puberty a definite cycle of changes is observed in the genital organs when pregnancy has not occurred. These changes have been named as follows—PROŒSTRUM or period of preparation, ŒSTRUS or period of sexual desire, METŒSTRUM which occurs if fertilization is absent and is a period of subsidence of genital excitement, and the ANŒSTRUM or period of rest in which the sexual organs lie fallow. At the end of the anœstrum a new sexual season occurs and the cycle begins again with the procestrum. Animals that conform to this type are termed MONŒSTROUS. Examples of monœstrous animals are many wild sheep in which the sexual season occurs once a year and the anœstrum or fallow period extends over several months. Another monœstrus animal is the domestic bitch in which however the anœstrum last only a few months and so three or even four cycles can take place in a year. The other type has been termed POLYŒSTROUS; in this case, in the absence of fertilization, there takes place after the metœstrum instead of a long anœstrum, a very short fallow period of a few days called the DIŒSTRUM, then a new cycle beginning with proœstrum starts again. After a few of these cycles a true anœstrum appears and lasts until a new sexual season occurs. As an example of a polyœstrous animal the mare may be taken. During a certain portion of the year she passes, when not pregnant, through a series of cycles separated each from the other by a short diœstrum, then a true anœstrum occurs and ends with the advent of a new sexual season. The polyœstrous condition is shown by domesticated cattle, sheep, and pigs. An extreme form of polyœstrous rhythm is displayed by man, certain monkeys, and some domesticated sheep. Here the anœstrum is absent and the cycles are separated only by short diœstral periods and the female is therefore capable of being impregnated throughout the year. But in most polyœstral animals the diœstrous cycles are only two or three in number. Domestication and change of climate and food have a marked effect on these cycles. Generally stated domestication tends to shorten or even obliterate the anœstrum and thus make the periods of œstrous or desire more frequent though possibly less intense.

The period of proœstrum has been termed the period of preparation, *i.e.*, preparation for a fertilized ovum. The external genitals become swollen and a discharge takes place from the vagina which may be bloody; there is also some general excitement and in some animals special indications, such as drooping ear in the sow, and blood-shot eye in the rabbit. But it is in the uterus that the most significant changes happen. The lining membrane thickens and its blood vessels become enormously dilated; some extravasation of blood beneath the surface generally occurs and may, in some animals, be so pronounced as to cause true bleeding into the uterine cavity. The innermost layer of the uterus breaks down in part and passes out as a mucous discharge, in some animals mixed with blood. These uterine changes may be regarded as all preparatory for the reception of a fertilized ovum. Immediately following the proœstrum is the œstrus or period of desire in which the male is sought. Its duration is short and rarely exceeds twenty-four hours. In many animals the female in œstrus possesses an odour which informs the male of her condition and excites him sexually. The œstrus in some animals, *e.g.*, sheep, may overlap the proœstrum to some extent. If the sexual act takes place, and should a fertilized ovum arrive in the uterus from either Fallopian tube, the uterine wall is now in a fit condition for the attachment and nourishment of the

ovum. Pregnancy begins and the sexual cycles are intermitted. But should no such ovum arrive the uterus returns to its normal state in a period of metœstrum. Then follows a resting stage of anœstrum or diœstrum and then the cycle begins afresh. Not only pregnancy but lactation (nursing) may check the occurrence of these cycles. This rule, however, is not without exceptions for many rodents may suckle a litter of young while pregnant with another litter, and the mare generally experiences œstrus nine days after giving birth to a foal.

PREGNANCY.

The number of fertilized ova that reaches the prepared uterus at one time varies with the species of animal. In the larger mammals one only is the rule. In the cat three to six, in the dog four to ten, and in the pig six to twelve ova are fertilized at the same time. In the bird and lower animals the fertilized ova leave the body with a supply of nourishment and continue their development outside the mother. In mammals however the ova depend from the first for nourishment on the maternal uterus. When the small mass of cells formed from a fertilized mammalian ovum reaches the uterus at the proper stage in the sexual cycle it remains adherent to the uterine wall. Subdivision and growth of the cells occur rapidly. After a short time a grouping of cells is evident, and the beginnings of skin, gut, and central nervous system become apparent. So far the nourishment required has been derived by simple absorption from the secretion of the uterine lining membrane, but when the embryo develops a system of blood vessels and a heart a more efficient method of obtaining nourishment is required. The embryo encloses itself in a bag containing a watery fluid and composed of a fairly tough membrane. The wall of the bag fits itself to the wall of the uterine cavity. The chief use for this is to shield the delicate embryo from injury and also to bear the brunt of the work of dilating the neck of the uterus and the vagina when the young is born. From a point in the embryo, which is afterwards recognised as the navel, a curious outgrowth arises called the ALLANTOIS, which eventually blends with a portion of the wall of the membranous bag to form the PLACENTA. The placenta sends long finger-shaped processes into similarly shaped depressions in the uterus which are lined by walls richly supplied with blood vessels. Two arteries from the embryo pass along the stalk of the allantois and break up into a dense meshwork of capillaries in the placenta; then the blood is collected into venules and finally into one large vein which runs parallel with, and close beside, the two arteries mentioned and brings back purified and enriched blood to the embryo. It must be remembered that there is no direct connexion between the blood of the fœtus and that of the mother. The embryonic heart pumps blood through its own body and through the placenta. In the finger-shaped processes or *villi* of the placenta the separation from the maternal blood is effected by a very thin membrane through which the exchange takes place. The blood of the fœtus takes up oxygen from, and gives off carbon dioxide to, the maternal blood. It was formerly thought that the nutriment required by the embryo simply filtered through from the uterine blood vessels into the capillaries of the placental villi, but there is reason to believe that the placenta is a digestive organ breaking down the necessary constituents of the maternal blood and passing them into the blood of the fœtus. The stalk of the allantois with its vein and two arteries is known in the later stages of embryonic development as the

UMBILICAL CORD. The shape and attachment of the placenta varies in different species of mammals; in some the finger-shaped processes or villi are simple and when the young is born are detached from the uterine wall without producing any tearing. In such cases the placenta comes away without any portion of the uterus being attached to it—such placentas are termed *non-deciduous*. In others the villi are so locked in the uterine tissue that when the young is born the villi drag with them pieces of the inner wall of the uterus and leave what may be termed an open sore at the site of the placental attachment. Such cases are called *deciduate*. We may classify placentation roughly as follows:—

Deciduate	Meta-discoidal—the villi are at first scattered, but are collected into a disc—man and monkey.
	Discoidal—the villi are restricted to a cake-like disc—rodents.
	Zonary—the villi are restricted to a belt-like band—carnivores, elephant.
Nondeciduous	Cotyledonary—villi in patches—ruminants.
	Diffuse—villi scattered—pig, horse.

As development proceeds the cells of the embryo increase continually by subdivision and the organs approach nearer and nearer to the condition that they present at birth. One extraordinary fact about embryonic development is that a number of stages are traversed which are singularly reminiscent of stages in the evolutionary ascent of the race. Thus all mammalian and bird embryos at one period of growth show clefts in the throat like the gills of a fish, and the human embryo at one time possesses a tail.

From the moment of entry of the fertilized ovum the uterus begins to change. Instead of the metœstrum a long series of important alterations takes place too complex for full description here. The uterus grows parallel with the growth of the embryo and the membranous bag of the latter, its muscular walls increase enormously in thickness and in the size and power of the constituent muscular cells, and, where the placenta is to be formed, an alteration in the inner wall is effected. These important changes in the uterus are the outcome of hormone stimulation. The developing ovum unquestionably furnishes one set of hormones, but these would apparently be useless unless backed up by hormones arising from the ovary and probably from one particular part of the ovary called the corpus luteum (Fig. 63). The corpus luteum is produced from a burst follicle and was originally thought to be only a lump of scar tissue but its secretory importance has been proved beyond doubt for if it be destroyed or if it fail to develop pregnancy comes to a premature end. What exactly determines the onset of parturition or labour has not been discovered. The muscular walls of the uterus contract powerfully in a series of "pains." Thanks to the membranes containing the watery fluid, the narrow neck of the uterus can be dilated without injury being done to the head or fore limbs of the fœtus. The pains continue until the membranes burst and the young, after undergoing a characteristic rotation, is driven through the vagina; after a variable interval the membranes and placenta are ejected by further uterine contraction. Once the placenta has been detached from the uterine wall the young animal can no longer get its oxygen from the maternal blood; slight asphyxia therefore ensues and through the stimulation of the respiratory centres by the asphyxial blood the first breath is taken. Coincidentally with this a change takes place in the heart so that the right ventricle which in the fœtus sent its blood into the aorta now drives blood into the lungs through the pulmonary artery and the condition of the circulation present in the adult is established.

After the expulsion of the placenta and membranes the uterus rapidly contracts upon itself and undergoes a sort of degeneration, becoming smaller and less muscular, and finally approaches the state characteristic of the non-pregnant female. Its contraction is greatly aided by a nervous reflex started by the young sucking at the teat.

	Time Interval between Œstrus and Œstrus in Non-pregnant State.	Time Interval Between Parturition and Return of Œstrus.
Mare	3—4 weeks	5—9 days.
Cow	3—4 weeks	21—28 days.
Sheep	17—28 days	7 months.
Sow	9—12 days	4—5 weeks, usually 8—9 weeks, maximum.
Bitch	12—14 weeks (anœstrum)	2 months.

AVERAGE DURATION OF GESTATION.

Ass	365 days.
Horse	340 ,,
Horse (better breeds)	350 ,,
Cow	283 ,,
Man	280 ,,
Goat	154 ,,
Sheep	152 ,,
,, (merino)	150 ,,
,, (southdown)	144 ,,
Pig	120 ,,
Dog	63 ,,
Cat	56 ,,

AGE OF PUBERTY.

Rabbit, rat, in 1st year.
Cat, dog, sheep, pig, in 2nd year.
Horse, cattle, in 3rd year.
Man, in 14th year.
Elephant, between 20th and 30th year.

PERIOD OF SUCKLING.

Foal	12—20 weeks.
Lamb	8—16 ,,
Calf	6—12 ,,
Pig	4—8 ,,

INCUBATION PERIOD OF EGGS.

Goose	28—33 days.
Duck	28—32 ,,
Turkey	26—29 ,,
Hen	21 ,,
Pigeon	17—19 ,,

(*To be continued.*)

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 736, Vol. VI.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The European Dodder.

Cuscuta europæa, L. (*Convolvulaceæ*).

This annual parasite is easily recognised by its slender, twining, yellowish-green, practically leafless stems attached by minute suckers to the host plant, and bearing clusters of whitish or pinkish flowers. It is as great a pest to agriculture as the Mistletoe is to forestry. Two native species (*C. tasmanica*, Engel, and *C. australis*, R. Br.) are known and have played some part in keeping down native and introduced weeds (St. John's Wort). The most injurious Dodders appear to be the introduced ones (*Cuscuta epithymum*, Murr., *C. europæa*, L., *C. trifolii*, Bab., etc.) which are continually imported and spread by seed. These parasites will destroy any leguminous crop if unchecked. Where a whole field is infested the entire crop should be ploughed under, and if this is done before much seed has been formed, after a year's fallowing (bare or green), followed by wheat, oats, maize or a similar crop, it will be safe to use the land for clover, lucerne or leguminous crops. If allowed to seed freely the seed in the soil may not be exhausted for five or six years.

PLATE 32.

J. White Del. A. J. Ewart Direx J. Kemp Govt. Printer

When small infested patches are found, a trench should be dug round the patch over which straw or long chaff sprinkled with kerosene has been spread. After firing and burning off, the soil can be thrown over the quarantined area, covering and burning any parts that have escaped destruction. It is wise not to remove the infested plants for burning as pieces left on the field or dropped in fresh places re-establish themselves and spread the evil. To attempt to tear out the Dodder with a rake is even more foolish. Spraying with copper sulphate or iron sulphate solutions have been recommended, but a badly infested crop cannot be saved in this or any other way. It is better to lose completely a small area of the crop by burning than to risk a much more serious infestation next year. Care should also be taken to use only clean seed. Indeed, the sale of seed containing Dodder should be a severely punishable offence.

Infested Clover or Lucerne should not be fed to stock, as seeds may be voided unaffected in the manure, and reinfect new ground. Above all, good cultivation in the widest sense should prevail, and all fields, hedges and ditches should be kept clean and free from weeds, especially leguminous ones. Dodder also grows on St. John's Wort and other weeds, but usually not on Compositæ. Several native species of *Cassytha* (Lauraceæ) are often mistaken for Dodder, which they closely resemble in habit and external appearance. They mainly grow on native plants, especially near the sea, but are not agricultural pests like the true Dodders, though, like them, they have no assimilating leaves and obtain food from the host plants on which they grow by means of their attaching suckers. *Cassytha* is a coarser plant, the fruits larger, less fleshy, not so densely clustered, and each one enclosed by a closely investing calyx barely open at the top.

NAPHTHALINE TREATMENT FOR CUT WORMS.

In view of the damage recently done to young vine plantations in several vineyards in the north-east by agrotis caterpillars, commonly known as cut worms, a recent article by M. P. Hoc in the *Progres Agricole et Viticole* of Montpellier (France) should prove of interest to vinegrowers.

M. Hoc deals with the damage caused by another shoot eating insect, *Helops lanipes*, and describes how young vines were saved from the ravages of this grub by the use of naphthaline at the rate of ½ to ⅔ oz. per vine. He also refers to the use of another insecticide known as vaporite, but it is not obtainable in Victoria.

Naphthaline should be well worth a trial against our cut worms. The drug is obtainable in Melbourne at 4d. per lb. wholesale. The earth around the young vine should be removed to a depth of a few inches, thoroughly pulverized, and the coarsely powdered naphthaline well mixed with it. This soil should be employed to reform the protecting mound round the base of the vine, which will, owing to the poisonous vapour of the drug, no longer serve as a shelter for the cut worms during the day time.

Another method would be to apply it in holes a few inches deep on, say, three sides of the vine. As soon as the drug is placed in the holes they should be blocked up with soil. This was the method followed in the case of "vaporite."

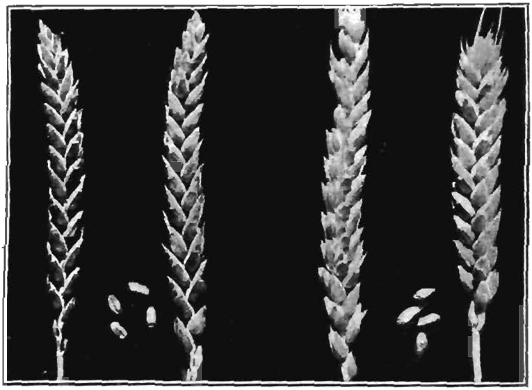
It would be well to try a few experiments in order to make sure that no damage is done to young shoots by the naphthaline. According to M. Hoc, up to ⅔ oz. per vine would appear to have had no injurious effect on vegetation.—F.C.

EXPERIMENTAL WORK AT LONGERENONG AGRICULTURAL COLLEGE.

E. G. M. Gibson, Science Master.

Wheat Selection.

While many valuable varieties of wheats have been raised by crossing, there is plenty of scope for improving varieties found suitable for a particular district, by careful selection. At the College last harvest, an experiment commenced on these lines has already shown itself worth recording. Dart's Imperial and Federation were chosen as being the best of the various varieties under cultivation. Plants were selected for their tillering and productive qualities, the preference being given to the largest heads with the least number of unfertile florets. The average number of unfertile florets in the general crop was four; in selected ears of Federation, two; and of Dart's Imperial, one.



SELECTED HEADS OF FEDERATION AND DART'S IMPERIAL.

In this manner two pounds weight of seed from each variety was obtained and sown in plots last June under field conditions. The plants have made vigorous growth, flowered early, and developed ears wonderfully true to type, the majority being full from base to tip. It must be noted that the selected ears were not phenomenal, but the best produced in the crop, and as good as any in the district. No attempt is made to raise new varieties, and although the process of hybridisation is familiar to the students, the seeds thus obtained are only grown for their experimental interest.

EXPERIMENTAL GRASS PLOTS.

1. English Rye Grass. 2. Italian Rye Grass. 3. Prairie Grass. 4. Toowoomba Canary Grass.

GRASSES.

Various plots have been sown to test the relative values of grasses and other fodder plants. A number of those tried have partially succumbed to the dry weather. The most promising of these unsatisfactory grasses will be tried under irrigation, and the rest discarded. Good growth has been made by *Lolium perenne* (English rye), *Lolium Italicum* (Italian rye), "*Phalaris Commutata*" (Toowoomba canary grass), and *Bromus unioloides* (Prairie grass). The latter seems to be a better winter grass for our district than the much-boomed "Phalaris commutata."

STUDENTS CROSS-FERTILISING WHEAT.

NITROGEN AND NITRAGIN.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany at the Melbourne University.

The chemical element nitrogen takes an essential part in the composition of all plants and is especially abundant in buds, seeds, flowers, growing tips, and, in fact, in all parts rich in the living plant substance, protoplasm. Hence a steady supply of nitrogen must be obtained in the food of plants, although in this respect the plant is far less wasteful than the animal and may use the same nitrogen over and over again once it has been absorbed. The source of the plant's supply of nitrogen is almost solely from the nitrates of calcium, magnesium, potassium, and sodium which are continually being produced in the presence of the requisite bases in every fertile soil during the decomposition of its nitrogenous humus. The nitrogen of this humus is oxidized in the presence of free oxygen by nitrifying bacteria, which are present in all ordinary soils. Ultimately nitric acid is formed, usually with ammonia and nitrous acid as intermediate products, and this nitric acid combines with the alkaline bases present in the soil to form nitrates.

This process is a continuous one, and takes place most rapidly when the soil is warm, moderately moist and well aerated. It stops, or becomes very slow, if the soil is at all acid, completely dry, very cold or in a swampy, badly aerated condition

When a soil dries up in which nitrification has been active, the nitrates may sometimes be so abundant as to form an efflorescence on the surface of the soil. Since all these nitrates are, however, soluble in water, any heavy shower of rain will tend to wash out the excess of nitrates from the soil before the roots have time to absorb them. Hence there is far less danger of loss, and a more permanent effect is produced when the nitrogen needs of the plant are supplied by the bacterial oxidation of humus manures applied to the soil, than when the same amount of nitrogen is directly applied in the form of a dressing of Chilian saltpetre (sodium nitrate).

Although the air, which contains four-fifths by volume of nitrogen, represents an enormous total amount of this element, it is not directly of use except in a few special cases. Ordinary green plants can make no use whatever of the free nitrogen of the air. It enters the plant, and is found dissolved in the sap in every part, but cannot be assimilated or used as food any more than horses can digest the sand which they often swallow when grazing. Every thunderstorm, however, and also certain slow chemical processes of oxidation like that of phosphorus in moist air cause the oxygen and nitrogen of the air to combine, ultimately forming nitric acid, which is washed down by the first shower of rain. In the same way, whenever the air contains ammonia derived from manure heaps, or from decaying animal or vegetable matter, this is washed down by the rain, and oxidized to nitric acid and nitrates in the soil.

The amount of combined nitrogen available for the plant's use which reaches the soil in this manner, although quite appreciable, is never more than a small fraction of that removed from the soil by drainage and by the crops. Under the most favourable circumstances it does not represent more than a tenth or twelfth of the annual loss of nitrogen from a well-drained, cultivated soil with an average rainfall, and is usually considerably less.

Certain organisms exist, however, in most soils which have the power of assimilating the free nitrogen of the air and ultimately enriching the soil with combined nitrogen available for the plant's use. The most important of these organisms is *Clostridium Pasteurianum*, an anærobic bacterium, which is unable to exist in ordinary soils unless supplied with free nitrogen and unless associated with certain other micro-organisms. The latter shield it from the oxygen of the air, which is poisonous to this organism. If all the required conditions were fulfilled, soils containing this bacterium might gain from 20 to 30 lbs. of nitrogen (= 120 to 180 lbs. of sodium nitrate) per acre per annum. As a matter of fact, the actual gain due to the presence of this and similar micro-organisms appears usually to be comparatively small, partly because the conditions are rarely the best possible and partly because denitrifying bacteria are usually also present which set free the combined nitrogen of the soil and may in some cases cause a loss instead of a gain to occur. In addition, the conditions which favour the fixation of nitrogen by soil bacteria not dependent upon leguminous plants are, in general, not the most suitable ones for the development of ordinary crops.

It is well known that leguminous plants differ from ordinary ones in having the power of assimilating the free nitrogen of the air, and hence can exist on the poorest and sandiest soils where nitrates are practically absent or very deficient in amount. They have, however, this power only when peculiar tubercles are developed on their roots which contain nitrogen fixing bacteria derived from the soil or originally present on the coats of

the seed. These root tubercle bacteria penetrate the young roots and there give rise to tubercular swellings, in which the bacteria are nourished and carry on the assimilation of free nitrogen for the benefit of the plant bearing them. If the root tubercles are not formed, then leguminous plants are as dependent upon supplies of combined nitrogen (nitrates, etc.) as are ordinary plants, so that whenever a leguminous crop, which usually does well on a particular soil in the absence of nitrates, fails to grow well, the first investigation to make is to pull up some of the plants and see whether the failure is due to the absence or deficiency of root nodules. In this connexion it must be remembered that the use of nitrates as manures tends to suppress the formation of root nodules, since these are then less necessary.

If a leguminous crop fails owing to the non-formation of root tubercles, it may succeed if the necessary bacteria are supplied to the soil or young seedlings. The root tubercle bacteria appear all to belong to a single species, *Bacillus radicicola,* but several varieties grow on different plants and these are not mutually interchangeable. Thus, the variety from the pea will infect the bean, but not clover. The soja plant of Japan usually forms no tubercles in Europe although they are abundantly produced in Japan, where the appropriate variety of bacterium occurs. In such cases, *the bacterium may be supplied to the soil from a plant of the same kind* as that which is to be grown, by crushing its root tubercles to a thin paste with cold water and either spraying the diluted mixture over the land or soaking the seeds in it before planting. A single large root tubercle may contain several million bacteria, and only one bacterium is needed to start each fresh root tubercle, so that the root tubercles from a small number of plants would be sufficient to infect an acre of soil or several bushels of seeds. Once added to the soil they appear, however, to die out before long in the absence of an appropriate host plant, so that the direct application to the soil usually involves considerable waste and may be quite ineffective.

Cultures of nitrogen fixing bacteria, usually termed *nitragin,** have been placed upon the market and extensively boomed both for direct application to the soil and to the seeds before planting. These cultures are only effective when they contain the particular variety of bacterium required, and they are no better than the material which can be derived directly from the root nodules. The cultures soon lose their efficacy, and in many cases have been shown to contain none of the required bacteria at all.

In fact, in certain cases, unscrupulous persons have taken advantage of a useful scientific discovery to make money by palming off *worthless rubbish upon farmers* eager to adopt scientific methods. It cannot be too strongly emphasized that no heavy outlay for a supply of "nitragin" is justified unless the farmer:

Firstly, is unable to grow certain leguminous crops satisfactorily, even in the presence of lime, potash and phosphoric acid in sufficient amount in the soil.

Secondly, finds by direct observation that this is due to the non-formation of root tubercles.

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*A very unfortunate term, well adapted for booming a commercial product, but highly confusing to farmers since "nitragin" is the phonetic spelling of the chemical element, nitrogen, as customarily pronounced, and all farmers now realize the importance of *nitrogen* in plant nutrition.

Thirdly, is unable to procure a supply of the same plant-bearing living root tubercles which can be directly used for infecting the seed or soil.

Some of the forms of "nitragin" have been supposed to contain the bacteria which live freely in the soil and enrich it with nitrogen. This is probably a misstatement. In any case, the use of such cultures would not be profitable, because these soil bacteria are usually present in all soils capable of maintaining them, and when added to a soil from which they were originally absent, they usually rapidly tend to disappear again.

Further, the net result of the activity of soil bacteria in rich, well-manured soils is to produce a loss rather than a gain of nitrogen, and hence no advantage is to be expected by the addition of cultures of any kind of bacterium to such soils.

To sum up, in the present condition of our knowledge, the use of "nitragin" in agriculture is not at present to be recommended except under very special conditions. Even then the same results might be obtained by the far better and cheaper methods indicated above.

WHITE SCOUR IN CALVES.

A correspondent (Mr. W. H. Chesterfield) writes:—"Having often noticed inquiries in various papers for remedies for White Scour in Calves, perhaps a method of treatment I have followed may be successfully adopted by others. With us the egg cure was the most effective of all we tried. Sometimes the calves would be so bad that they could only lie on their side and pant.

We would break an egg so that it would pour nicely, and slowly empty it down the calf's throat out of a gravy boat or anything handy. An egg was given three or four times a day; sometimes it would take, perhaps, 3 dozen to make matters right but eggs are usually plentiful and cheap when scours are prevalent. As soon as the ailment is noticed, reduce the milk allowance by quite half, and when very bad give nothing but eggs, gradually coming back to the milk allowance. Clean, warm and dry quarters are necessary for young calves. I think White Scour is most prevalent during the wet weather in early spring, especially if hot and muggy.

For any looseness of the bowels, we mix, say a pint of lime water in the calf's feed for a day, but with the poddies always give the eggs for the curdy and bloody stage. We place the affected animals on a bag out in the sun and persevere with them, and I have seen some very bad cases recover; in fact, we rarely lost one after the treatment described."

THE ORCHARD.

James Lang, Harcourt.

During December the weather has been very dry, no rain of any consequence having fallen, and as far as appearance goes, the outlook for January is much the same. Where the surface of the orchard has been kept well scarified and free from weeds, there is still a good supply of moisture in the subsoil which will carry the trees on for some time yet. It will be well to keep the scarifier going after any shower of rain we may get, as it keeps down weeds and leaves the surface soil in good condition.

Where water is available for irrigation the trees should be liberally supplied. In a season like the present the advantage of a good supply of water is apparent to all, as trees having plenty of moisture are enabled to mature their fruit to a good marketable size, and are left in a much better condition for next season's crop.

Gathering and marketing the fruit will now take up a good deal of time. Cherries have been a good crop, and owing to the hot weather they have ripened earlier than usual. Apples will be fit to gather for export quite a week earlier than usual. The apple crop promises to be very good, the fruit so far having swelled up to a good size, larger than usual so early in the season, and if the development continues the quality for export should be excellent.

Bitter Pit has not yet so far affected any of the apples; it may, however, appear later on. Orchardists should make a note of the time when they first observe any sign of the disease so far as to know at what stage of the growth of the apple it makes its appearance. This disease has become more prevalent of late years than formerly, and no remedy has yet been discovered to check the spread of it. Scientific observers in different parts of the world are now engaged in investigating the cause, and it is to be hoped that success will attend their efforts, and lead to the discovery of some remedy that will check its spread.

Spraying for Codlin Moth will still require attention during the month, as the second brood of moths will soon appear, especially in those districts north of the Dividing Range where the climate is warmer. To neglect spraying now, is to undo a great deal of the work already done. Bandages should be examined carefully, every ten days and all grubs destroyed. This should not be neglected, as many of the grubs have now left the apple and entered the chrysalis stage and will soon develop into moths ready to lay a second lot of eggs.

Where the Woolly Aphis has appeared on the apple trees, the thin spray wood in the interior of the tree, if affected, should be cut out and the diseased parts dressed with the sulphur potash remedy previously recommended (page 126, February, 1907).

Newly planted Citrus trees will require water to help them over the summer; also mulch around the roots with straw or other litter as it keeps the ground damp for some time after a watering.

Budding stone fruits may be done towards the end of the month, and on through February. Where the bark of the stock does not run freely, give a good soaking of water two or three days before the operation is to be done. This will cause the bark to rise much more freely, and facilitate the success of the operation.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

DISEASES OF THE BLOOD AND CIRCULATORY ORGANS.

(Continued from Page 754, Vol. VI.)

Toxæmia or Blood Poisoning.

(SAPRÆMIA, SEPTICÆMIA, PYÆMIA.)

BLOOD POISONING in a wide sense may perhaps be made to include all the conditions in which it is altered or untowardly affected by the presence in it of foreign matter or excess of matter naturally present as urea in ureamia, bile in jaundice, &c.; but blood poisoning proper or TOXÆMIA is limited to that diseased condition of the blood brought about by the absorption into the blood of germs or their products (toxins).

The absorption usually takes place through wounds which are septic, that is, wounds in which a state of putrefaction exists resulting from the presence of pyogenic (pus-forming) germs.

Poisoning of the blood also occurs in tetanus (lockjaw), anthrax, milk fever (probably), but in these cases the toxins are the products of specific germs.

Sapræmia and Septic Intoxication is that form of blood poisoning due to the introduction of the chemical products of the septic germs without the germs themselves being introduced. Unassociated with septicæmia the condition is not a common one because a comparatively large amount of toxin is required to produce deleterious effects and if the excretory organs (kidneys, liver, skin, &c.) are acting well they pass the toxin out from the blood before there is sufficient accumulation of it to produce a poisonous effect. Sapræmia may however occur immediately after parturition from absorption from the congested lining of the wombs; or from wound surfaces which are extensive; or from ulcerated wounds, either internal or external, when the excretory organs are below par and so by failing to discharge it allow of the accumulation of the poison in the blood.

Septicæmia or Septic Infection is the most common and dangerous form of blood poisoning. In this case there is actual absorption of septic germs and multiplication of them in the blood. On account of the latter feature the condition may be set up from even the smallest of wounds; especially punctured wounds in which there is imprisonment of the discharges. Once the germs are absorbed they grow and increase enormously in the blood and so keep up a continuous supply of their poisonous products or toxins.

In both sapræmia and septicæmia death occurs quickly and is usually preceded by delirium. The post mortem appearances are also similar although somewhat indefinite. Putrefaction sets in early and *rigor mortis* is hardly observable. The serous membranes, particularly the lining of the heart and blood vessels, are often blood stained in patches from the rapid disintegration or *Hæmolysis* of the red corpuscles. Minuter hæmorrhages (called *ecchymoses*) may be found through the tissues. These are probably due to increased permeability of the wall of the blood vessels

where it has been attached by the chemical poisons produced by the germs circulating in the blood. The lungs are frequently congested and the spleen is enlarged. The blood is darker than normal and may not coagulate readily.

Pyæmia. — "Pyæmia differs from septicæmia in that the absorption and dissemination of the poison give rise not only to a general infective diseases but also to scattered abscesses. It is always accompanied by some septicæmia. The source of injection is usually some suppurating wound. Any of the pyogenic organisms are capable of producing pyæmia but the *streptococcus pyogenes* is the one most frequently found" (*Green*).

The abscesses mostly have their commencement in small blood vessels and result from embolism. Small particles of pus, or fragments of pus-impregnated clot from a wound, are passed into the blood vessels and carried by the blood stream until they form an embolus by blocking at a junction or in a narrowing vessel. A thrombus is formed in which the pus germs commence their activities and an abscess results.

The best example of pyæmia in the lower animals is "Navel ill" or umbilical pyæmia of foals and calves, a condition fairly common and troublesome which will be dealt with in the chapter of Diseases of Young Animals.

Pyæmic abscesses are sometimes met with in the liver and other internal organs of cattle and sheep and they may occur as a sequel to suppurative disease of any organ but it may be said with the above mentioned exception, that the pyæmic condition is a rare one in veterinary patients.

Ureamia.

This is a condition of the blood in which there is accumulation of an excess of urea and other urine elements. It occurs as a result of disease or inactivity of the kidneys. The retained materials have a toxic effect on the nervous system producing drowsiness and death by coma preceded by convulsions. During the progress of the disease the excretory powers of the liver and skin are invoked to rid the blood of the contained poison, and a marked symptom is the urinous odour of the sweat which is also very profuse. Ureamic poisoning does not occur from reabsorption of secreted urine; nevertheless when the bladder or urinary passages are blocked, and preventing from employing their contents, the accumulating urine dams back up into the uriniferous tubes and malphigian bodies of the kidneys and so arrests their function of excreting the urine elements from the blood and ureamia supervenes. This occurs occasionally after inoculation of cattle for pleuro-pneumonia when the swelling passes up the tail to the rump and inside the pelvis; the immense effusion that occurs pressing on the bladder and preventing the expulsion of urine.

Jaundice or Icterus.

There are two forms of jaundice brought about in different ways. In one case there is accumulation in the blood of the bile forming elements which should be removed by the liver. This occurs when the liver is deranged to the extent of total or partial loss of bile-secreting function. In the other form there may be no abnormality of the liver at all; the bile has been formed and passed into the bowels, from where, on account of impaction or other blocking of its elimination, it has been reabsorbed into the blood. In both cases there will be an attempt on the part of the

kidneys to relieve the blood of its excess of biliary matter and the urine will be changed in composition. In the former case it will contain only the biliary pigments or colouring matter which is formed in the blood from decomposition of the hæmatin of the red blood copuscles. In the latter case it will contain in addition the bile acids which have been formed during the process of secretion of bile by the liver. Hence a means of diagnosis of the two conditions is ready to hand in the analysis of the urine by Gmelin's test for bile pigments and Pettenkofer's test for bile acids*.

The jaundice resulting from non-secretion of bile is simply a symptom of liver disturbance and will be treated of in another chapter. That however resulting from reabsorption of secreted bile has usually nothing to do with the liver and will require different treatment—usually an aloetic purgative—physic ball in the case of the horse—is prescribed for the purpose of removing any obstrucrion to the onward flow of bile through the intestines.

The SYMPTOMS of jaundice are:—yellowness of the visible mucous membranes—eye, nostril, &c.; slow pulse; torpidity and flatulence of the bowels; fæces scanty, dry—and may be dark coloured; urine high coloured, thick and gummy or mucilaginous; in milch cows the milk becomes deepened in colour. The animal is dull, lethargic and debilitated and has little or no appetite.

Rheumatism.

Although it is likely that rheumatism will be proved to be an infective or germ disease, the experiments of Poynton and Paine (1902) seeming to establish the existing of a specific diplococcius in the blood, it is preferred to treat of it here as a blood disease on account of the excess of certain minerals (principally bi-urate of sodium, lactic and lithic acids) in the blood being an almost constant association of the disease. In any case only slight reference is considered necessary for it has been by no means well established that rheumatism at all commonly, if ever, affects animals. As remarked by Hayes, "a verdict of rheumatism is not unfrequently used as a convenient 'get out' by persons who in certain cases are unable to determine the cause of lameness or pain" but that by no means establishes the prevalence of the disease. Occasionally cases are seen presenting symptoms corresponding to those exhibited in acute rheumatic fever in man and some horses are affected with intermittent and metastatic lameness, which is ascribed to rheumatism but which it would be perhaps more correctly to consider as GOUT. An undoubtedly gouty habit is shown by some horses when indulged with a highly nutritious diet without a correspondingly heavy amount of exercise. It is exhibited by a stiffness in movement in the stable and stiffness awkwardness or actual lameness for a time on being put to ordinary work.

Conforming however to the accepted notion of the prevalence of rheumatism in animals the following remarks are submitted:—

The disease is stated to be brought on by exposure to dampness and cold especially after profuse perspiration. There is decreased activity of the skin of an accumulation within the blood of the normal constituents of sweat. It may become localized in the loins, causing lumbago or "chine felon" in cattle, or in the valves of the heart or in the joints

* For the details of these tests any work on Practical Chemistry may be consulted.

of the limbs (rheumatic arthritis). In the latter case the joint becomes swollen, hard and painful and this condition may exist for some time and then subside and reappear in another limb. When fixed in a joint rheumatism results in removal of the articular cartilage in parts and the deposition on the surface of the denuded bone of calcareous matter which becomes highly polished from friction, and is hence termed "porcella neaneous deposit." The urine contains excess of salines.

TREATMENT.—Alkalies such as carbonate of soda and potash are given to counteract activity; purgatives and diuretics to cause elimination of the foreign matter. Colchicum and iodide of potassium, salicylic acid, and the salicylates of sodium and potassium are advised as being especially beneficial. Locality, for affected joints, hand rubbing and the application of stimulating liniments or even blisters are advocated.

Heart Affections.

Diseases of the heart are very rare in animals. Occasionally racehorses may present a so-called HYPERTROPHIED HEART but it is merely increase in muscular tissue—an increase in size of the muscle fibres—the result of a long period of high training and is never associated with structural disease.

Fatty infiltration of the heart muscle is seen in over-fat show cattle and in fat pigs but here again the condition is one of atony and not of disease. Heart weakness from such a cause will be shown sometimes by respiratory distress of the affected animal on being unduly bustled, and this may develop into congestion or apoplexy of the lungs.

Rupture of the heart is practically unknown.

By aneurism is meant a local dilatation of a blood vessel so as to form a sac in which a quantity of only partially circulating blood is contained. Aneurisms occur principally in the heart and large arteries and in the horse they occasionally exist in the left auricle or in the posterior aorta. Aneurisms are really partial ruptures of the vessel and they form when there is some weakness of the coats of the vessels. Most often they take the form of "dissecting aneurisms;" that is, the internal coats of the vessel are ruptured and the blood impinges against and distends the external coat; it may also push its way for a considerable distance between the coats. It is when the strain on the outer coat becomes greater that the tissues can stand the vessel ruptures and death from internal hæmorrhage results.

Phlebitis.

Phlebitis is an inflammation of the coats of a blood vessel. In animals its only occurrence is as a sequel to blood-letting. The wound made in the jugular vein may become inflamed. Thrombosis follows and the vein may become obliterated.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

POISONINGS.

OCCURRENCE IN AUSTRALIA.—Evidence of plant poisoning.
CLASSIFICATION.—Mineral, vegetable, animal—Irritant poisons—Narcotic poisons.
ANTIDOTES, mechanical, chemical, physiological.
MINERAL POISONINGS. Arsenic—Lead—Phosphorus—Mercury—Acids—Alkalies—Carbolic—Cyanide—Brine.
PLANT POISONINGS.—Native Tobacco (tobacco blindness)—Strychnine—Nightshade—Sorghum—Homeria (Cape Tulip)—Zamia—Tutu or "Toot"—Euphorbium Drummondii—Potato—Stinkwort—Yellow rash lily—Castor plant—Indian Mutter—Native Lucerne—Darling Pea or Indigo—Other plants reputed as poisonous to stock, exotic, indigenous.
MOULDS.—Rust—Smut—Scum—Fungi—Ergot of rye.
ANIMAL POISONINGS.—Snake bite—Ticks.

In Australia the subject of animal poisoning is vested with more than ordinary interest, particularly that form of poisoning which is attributed to the eating of noxious plants. As in all new countries, the vegetation is unfamiliar, and consequently many plants which in reality are quite harmless are apt to be suspected as harmful to stock. There exists a tendency to ascribe any sudden or considerable mortality amongst sheep or cattle to the eating of some supposed poison weed. Even when the idea of any particular plant being poisonous has been thoroughly discredited, as in the case of *Euphorbium Drummondii* and Black nightshade, the plant poisoning tradition still lingers. Oftentimes also, when no evidence is adducible that poisonous plants have been eaten by stock, or that they even exist on the pasture, the plant poison theory is stuck to. It affords the most ready explanation of fatalities, and is consequently more acceptable to the illiterate than any hypothesis regarding anthrax, blackleg or other contagious disease, as accounting for the mortality.

The minimum evidence that should be required before a reliable determination is come to that the cause of death is plant poisoning should include :—

(a). The finding of undigested parts (leaves, stem, berries, etc.) of the suspected plant mixed with the paunch contents.

(b). The finding of evidence in the pasture that the suspected plant had been recently nibbled or eaten in quantity sufficient (according to the number of animals affected within a given time) to produce poisonous effects.

(c). The experimental feeding of other animals with the suspected plant or the drenching of them with a decoction made from the plant.

(d). The identification of the plant by a competent scientific authority as a recognised poisonous plant, or, failing that, the finding of a deleterious poisonous principle on analysis, and in such quantity as to constitute a poisonous dose. In the latter case the analysis must be corroborated by experiments on animals.

The statement may be ventured that, if these conditions are complied with, not more than five per cent. of the reputed fatalities from eating poison plants will be proved to have been so brought about. To hold this view it is not necessary to deny that many indigenous Australian plants possess poisonous properties, nor that a large number of exotic poisonous plants have been introduced and flourish here; it is only necessary to know that healthy animals but rarely, either wittingly or unwittingly, eat vegetation that is poisonous. Animal instinct is usually sufficient to prevent herbivorous animals eating a sufficient quantity of noxious plants to produce toxic

effects. The perfumes or acridity of such plants act as a deterrent, except when the taste is depraved and the animal ravenous from starvation. Field experience in the investigation of outbreaks of contagious disease tends to discredit the alleged frequency of plant poisoning. At all events, when dealing with disease outbreaks it is but rarely that the "plant poison" theory to account for the mortality is not trotted out. Recently there has been a slight diversion from the previously universal plant-poison hypothesis in the direction of "impaction" or "starvation from soil-exhaustion" as accounting for many fatalities amongst stock apparently otherwise unexplainable. The average stock owner is loth to believe that he has got contagious or infectious disease amongst his flocks or herds and he prefers to encourage the feeling of security against the continued losses which he knows will accompany a disease outbreak. It is a further solace to him that mortalities from plant poisoning do not involve visits of inspectors or the imposition of isolation, quarantine or other annoying and, as he thinks, unnecessary restrictions.

Many deaths of cattle and sheep occur from a kind of pseudo-poisoning which is really only acute indigestion, resulting from a too free indulgence in indigestible foods which therefore often get the credit of being poisonous. If, when these animals are ravenous for food, they are injudiciously allowed access to highly succulent herbage such as lucerne, trefoil, rape, young thistles, clover, larkspur, Cape weed, dandelion, marsh mallow, milk weed (*Euphorbium Drummondii*) and several other plants which have rapid growth, the animals oftentimes gorge their stomachs beyond the power of ordinary digestion. Chemical changes in the food as it lies in the stomach, give rise to the formation of gases which cannot get exit. A condition of "hoven" or flatulence is set up and many beasts die—suffocated, not poisoned. Stock should only be allowed to feed sparingly on such food until they become accustomed to it.

Classification of Poisons.

Poisons are classified as MINERAL, VEGETABLE and ANIMAL POISONS, according to the kingdom they are derived from.

They are also classified according to their action into two main divisions :—

(a) **Irritant Poisons** which have an inflammatory or destructive action on the tissues with which they come in contact, and give rise to symptoms of pain, colic, fever and inflammation. Of these, arsenic in the mineral kingdom, euphorbium in the vegetable kingdom, and cantharides (Spanish fly) in the animal kingdom are typical examples.

(b) **Narcotic Poisons** which exert a depressing influence on the nervous system and produce stupor, unconsciousness, staggering, paralysis, and convulsions. Narcotic poisons principally belong to the vegetable kingdom, the most marked exception to this being perhaps the venom of snakes.

Antidotes.

Antidotes are agents which mitigate, arrest or counteract the action of poisons, and according to the manner in which the antagonizing of the poison is effected they are classified as mechanical, chemical and physiological antidotes.

Mechanical Antidotes include such substances as charcoal, earth, white of eggs, flour gruel, starch gruel, milk, butter, oils and fats. These either mechanically absorb or envelop the particles of poison and so retard their absorption, or they ensheath and protect the mucous surfaces from contact with the poison and so prevent irritation. Their use is principally indicated in cases of irritant poisoning. The artificial production of vomition and the emptying of the stomach with the stomach pump may be regarded as mechanically antidotal measures.

Chemical Antidotes are those which by acting chemically on the poison so change its character as to render it innocuous, whether by a lessening of causticity or by transforming it into an insoluble substance. For instance, alkalies counteract acids, as when lime water is prescribed in sulphuric acid poisoning the insoluble sulphate of lime is formed; albumen (in the form of white of egg) combines chemically with corrosive sublimate and forms the insoluble and non-irritating albuminate of mercury; and *sulphuric acid in contact with lead salts forms insoluble sulphate of lead.*

Physiological Antidotes, while having no action on the poison itself, produce an effect on the animal directly antagonistic to that produced by the poison. Thus, stimulants are physiological antidotes to narcotic and sedative poisons; ammonia for example being correctly prescribed in prussic acid poisoning, strychnine as a nerve stimulant in snake-bite and atropine in tobacco poisoning. Opium, chloral hydrate, conia and other sedatives are used as physiological antidotes in poisoning by irritants or stimulants.

MINERAL POISONS.

Arsenic Poisoning.

There has been at various times very great mortality amongst stock in the vicinity of pyrites works due to poisoning by arsenic. In the roasting of the ore, arsenic in the form of arsenious oxide ($As_2 O_3$) is driven off and if its escape is not prevented by condensation at the works it is deposited on the surface of the ground in the vicinity. The herbage becomes covered with a layer of arsenical dust, and when eaten by stock, arsenic poisoning results. Of course the greatest deposition occurs immediately adjacent to the works where the herbage, shrubs and trees may be completely destroyed. Creek waters may be impregnated to such an extent as to give rise, on drinking, to symptoms of poisoning. In the direction of prevailing winds, however, the fumes may be carried a considerable distance and the danger of stock poisoning, even upwards of a mile away, may be evidenced by the sickly paleness of the grass and the "pitting" and shrivelling of young leaves of trees in exposed situations.

In 1898 I undertook an investigation regarding an allegation of wide-spread poisoning of stock by arsenic on one of the smaller Victorian goldfields. On a common on which pyrites smelting works were situated forty-one horses and eighty-one cattle (total stock 122) had died at different periods during the previous twelve months. All the lambs born on the common during the year had died, and out of a flock of forty sheep, placed there in the belief that they would withstand the arsenicated herbage, fifteen died. A number of turkeys and fowls also died in the vicinity of the works. The investigation resulted in bringing to light convincing evidence that the majority of these deaths had been directly caused by arsenic poisoning. Some of the victims succumbed to an acute attack and others were affected chronically. One resident lost eleven head

of cattle within forty-eight hours, and at another time fourteen horses died within a period of three weeks. Arsenic was found thickly deposited on the leaves of grass and trees on the common, in the water of a creek near by and in the stomach and intestines of animals found dead near the works. It was ascertained that from 480 to 640 tons of ore containing 10 per cent. of arsenic were treated per month and in spite of the considerable market value of arsenic the condensing plant was of the crudest, so that a large proportion of the arsenic was allowed to escape with the fumes.

An account of some of the typical cases encountered during the investigation will serve to convey an idea of the salient symptoms and post mortem appearances.

CASE 1. A nine months old calf examined when virtually at the point of death. The *symptoms* exhibited were extreme weakness and emaciation with evidence of fœtid diarrhœa, coat long and staring, skin dry and hidebound, loss of muscular co-ordination, pulse imperceptible, temperature elevated, respirations hurried, dry muzzle, furred tongue, with slimy froth issuing from the mouth, blind with longstanding ophthalmia and ulceration and staphyloma of each cornea. The calf died about six hours later, and was at once examined. *Post mortem examination* revealed redness and congestion of the alimentary tract, especially on the fourth stomach (abomasum) and first portion of the small intestines (duodenum) amounting to gastro-enteritis. Other parts of the intestines were congested in patches, on some of which was a blood-stained effusion. The contents were fluid and dark coloured. In parts the omental membranes (caul net) were infiltrated with a straw coloured and slightly gelatinous exudate. Lungs congested. Heart flabby, with ecchymosis of the heart sac (pericardium). Tongue enlarged and dark coloured. Eyes ulcerated. A portion of the duodenum about 4 inches long with its contents was procured and ligatured and sealed at each end. This was preserved in a jar in a 3 per cent. solution of formalin, and submitted to Mr. C. R. Blackett, Government Analyst, for analysis. His report, dated 1st March, 1898, was as follows:—"Intestine of calf—weighed 92.6 grammes. Liquid in the jar measured 200 c.c. and contained arsenic which weighed 4 milligrammes."

CASE 2. This was a cow which died about three hundred yards from the works. *Post mortem examination* was made about thirty-six hours after death, and at that time decomposition was only slightly advanced, there being comparatively little putrefactive odour. The first stomach (paunch or rumen) was moderately full of ingesta, mainly grass. The mucous lining of the rumen was black and easily detachable from the submucous coat. A large quantity of straw-coloured gelatinous exudate was distributed—in some cases to a thickness of over two inches—in the external interstices between the divisions of the paunch, also in the external covering of the third and fourth stomachs and particularly surrounding the junction of the fourth stomach and small intestine. The remaining organs did not exhibit any changes other than those which may be common to a variety of disorders.

CASE 3. A two year old heifer found dead about a mile from the works and known to have been grazing on the common for only five weeks. On *post mortem examination* the appearances seen were mostly similar to those exhibited in Case 2, particularly the straw-coloured gelatinous exudate of lymph on the external surfaces of the stomachs and small intestines.

CASE 4. A four year old horse stated by the residents to be "in the middle stages of the arsenical poisoning disease." *Symptoms.* On being approached quietly he walked off with a staggering uncontrolled gait; head, neck and ears depressed and with a generally listless and drowsy action. On being excited by being bustled into a trot or canter the loss of muscular control or co-ordination of all four limbs was much more marked, and, when on steeply sloping ground, he more than once almost fell. When excited the head was thrown in the air and shaken from side to side in spasmodic and paroxysmal jerks, the eyes meanwhile protruding and fixed. Defective vision could be judged from the action of the animal during progression at different paces, and by the erratic method of striking a course to get away from pursuers.

Other evidence went to show that, in the majority of cases, horses showed no untoward symptoms for about a month after being brought to the neighbourhood. They then developed feverish symptoms, "shivers and sweats," a staggering gait and "madness" and died in from two to three days from the onset of these symptoms. In cattle (as would be expected from the greater dilution of the poison in the large quantities of ingesta contained in the paunch) the onset was more prolonged and the affection was characterized by symptoms of a more chronic character such as unthriftiness, capricious appetite, "pining," and extreme emaciation. The acute "madness" which was a prominent symptom in all severe advanced cases was manifested by violent contortions and convulsions succeeded by unconsciousness during which the animal often succumbed.

Acute Arsenical Poisoning.—The symptoms which may be looked for other than those detailed above are:—Great prostration of strength, nausea, loss of appetite, purging, colicky pains, redness of the visible mucous membranes, pulse frequent and wiry or imperceptible, coldness of extremities, quickened breathing and latterly coma

Chronic Arsenical Poisoning.—In reference to this it has to be remembered that, if the amount of arsenic is limited in quantity and partaken of continuously over a lengthened period, a tolerance of the poison is acquired; and animals may then take with impunity a dose that would be sufficient to kill an animal unused to it. The practice of giving arsenic regularly to horses in small doses with a view of promoting condition, as evidenced by sleekness and glossiness of coat, is in vogue in various parts of England and Southern Europe and has been followed in some training stables in Australia. As long as the practice is continued, if it is not overdone at any time, excellent health appears to be maintained, but it is when the practice is stopped that the ill effects of the arsenic on the constitution are made manifest. Horses then quickly lose strength, fall off in appearance and become veritable "bad doers" for many months or even for two or three years. Racing men in Australia should have no difficulty in recalling many cases in which a change of trainer has sufficed to transform a brilliant two or three-year-old into a suburban plater, and the persistence with which complete loss of form, sometimes never recovered, has followed on the removal of horses from certain stables noted for the high performances of their youngsters, has been often remarked in this connexion.

The SYMPTOMS of chronic poisoning are those of indigestion, unthriftiness, dry staring harsh coat, continuous thirst, depraved appetite, perhaps a chronic cough, irritation and swelling of the eyelids, staggering gait and

lameness, swelling of the knees and other joints caused by a chronic inflammation, loosening of the teeth in their sockets, and blindness.

POST-MORTEM APPEARANCES. Some idea of these have been given in the previous recountal of cases. While they are very similar in all classes of animals they differ considerably with the severity and duration of the case. In acute cases the mucous lining of the stomach, particularly the villous portion, and of the anterior parts of the bowels is reddened and thickened and presents patches of inflammation and extravasation of amber-coloured exudate. The lungs are usually congested and the urino-genital organs are also more vascular than normal. The substance of all the solid organs and tissues has an unnatural oily or greasy quality, the result of a fatty degeneration of the tissues which goes on under the influence of arsenic. Putrefaction of the carcases of animals poisoned by arsenic is delayed and the tissues sometimes become dry and mummified.

TREATMENT. In acute cases treatment must include:—Firstly, the getting rid of any absorbed poison by the giving of emetics in dogs, the use of the stomach pump in horses and cattle; or in the latter by operative removal of the paunch contents through the flank (see page 71, vol. v.) Secondly, the giving of chemical antidotes by which the poison may be converted into a harmless, insoluble and unabsorbable salt of arsenic. The freshly made moist sesqui-oxide or carbonate of iron is the best for this purpose; it converts the free arsenic into insoluble arsenite of iron (Fe_4 2 As O_3). Dialyzed iron is also effectual and is more likely to be obtainable at the chemists. Thirdly, the retarding of the absorption of the poison by the giving of oils, lard, glycerine, gum mucilage or milk and eggs, all of which mechanically coat the walls of the stomach with a protective layer. Finally, the subduing of the violent pain and irritation by the administration of laudanum, morphine or other sedatives should be attended to. For some days after the acute symptoms have subsided soft food with an admixture of boiled linseed should be given.

In chronic cases recovery is best expedited by rational feeding on nutritious and easily digested foods, but considerable time must elapse before the normal vigour and tone are regained.

Lead Poisoning.

Lead poisoning in animals may be exhibited by acute, subacute or chronic pneumonia; the slow development of symptoms in the two latter being accompanied by the slow solubility of the poison.

Acute cases usually result from the eating of lead in the form of white lead, red lead or lead paint picked up on rubbish heaps by cows with a depraved appetite. The *symptoms* usually presented at first are those of acute abdominal pain—getting up and lying down again, switching the tail and kicking the abdomen, with occasional fits of bellowing; the eyes are glassy and protruding; bowels constipated, excreta coated with mucus, bloodstained and dark in colour; respiration is hurried; there may be hoven (tympanitis); the gait becomes unsteady and, beginning in the hind limbs and extending forward, motor paralysis follows; after which death takes place without much delay.

On *post mortem examination* some evidences of the ingestion of lead may be found in the stomachs, generally in the reticulum. The fourth stomach and small intestines will be blackened, may be inflamed, and the contents are harder than normal. The liver and kidneys will be pale and

friable and the spleen shrunken. The characteristic blue line round the gums at their junction with the teeth, so commonly met with in chronic lead poisoning in man, is seldom observed in animals. The presence of lead either in the stomachs or tissues may be easily detected by chemical analysis.

TREATMENT. Diluted sulphuric acid is perhaps the best chemical antidote, but sulphate of magnesia in the form of Epsom salts will usually be readiest to hand. Either of these will transform any lead with which they come in contact into sulphate of lead, which, being insoluble, cannot be absorbed into the system, and therefore, not being irritant, cannot produce any poisonous effect. The Epsom salts may be given in doses up to a couple of pounds, and by its purgative action it assists in expelling quantities of the poison from the bowels.

In **chronic** lead poisoning animals become thriftless, emaciated and affected with progressive paralysis. Appropriate treatment is the giving of small doses (two drams) of Potassium iodide daily over a lengthened period. It would appear that the iodide enters into chemical combination with any lead deposited in the tissues, dissolves it and forms soluble iodide of lead which is excreted from the system by the kidneys.

Phosphorus Poisoning.

Poisoning by phospborus is credited with the deaths of many cattle in rabbit infested districts. Cattle which have contracted the bone chewing habit are prone to eat dead rabbits which they come across; and, where poisoning of rabbits with phosphorous baits is carried on, they must frequently eat some which have been thus poisoned. But in view of the fact that the small quantity of phosphorus necessary to kill a rabbit would have but a slight effect on cattle, it is likely that deaths do not occur from this cause as often as is suspected. The immense capacity of the cow's paunch and the consequent dilution which any poison undergoes when mixed with the paunch contents must always be taken into consideration in this connexion; and it would appear, therefore, that a fair number of rabbits must be eaten, and that, too, within a short time, before fatal effects may be expected. On the other hand it is conceivable that a slow poisoning may result from the eating of phosphorized rabbits or baits over a lengthened period, and doubtless many cattle so become affected chronically.

SYMPTOMS.—In acute phosphorus poisoning abdominal pain (colic) is exhibited; there is increase of respiration and pulse, body tremors, perhaps jaundice and sometimes swelling of the tongue. The gait becomes reeling and uncontrolled and death is preceded by paralysis. Hæmorrhages such as exist in petechial fever may occur in sub-acute cases. In milking cows the supply of milk falls off considerably and may cease altogether.

POST MORTEM APPEARANCES.—In a genuine case of acute phosphorus poisoning the fumes of phosphorus may be smelt and seen rising as a whitish vapour when the stomach is opened. The contents or walls of the stomach will also appear luminous when seen in the dark. The stomach walls or those of the anterior intestines will present inflamed patches with exudation of a quantity of straw-coloured lymph. In cases where the phosphorus has been acting over a lengthened time punctate hæmorrhage may be observed on the mucous and serous membranes, and the liver, kidneys and other organs will be lighter coloured than usual and greasy to the touch on account of the fatty degeneration which phosphorus induces.

TREATMENT.—Milk, gruel, boiled starch and gum-water should be given, but not any oily substance because of the solubility of phosphorus in oil. Turpentine is also a recognised antidote and may be given in doses of from two to four ounces. Full doses of magnesia (1 to 2 lbs.) may also be given with good effect.

Mercurialism.

Mercury poisoning is not common in animals. When it occurs it is usually a result of the indiscriminate use of mercurial sheep dips, or of mercury ointments applied to wounds used as dressings in skin diseases. In such cases the mercury is readily absorbed into the system through the skin. Young cattle which have been treated for ringworm, and dogs, under treatment for mange with mercurial ointment, have occasionally been so poisoned.

SYMPTOMS.—The most marked symptom in mercurialism is what is known as "salivation" or ptyalism which is a profuse secretion of saliva, accompanied by an aimless masticatory movement of the jaws. The saliva drips from the mouth, the gums are swollen and sore, and the secretion of tears is also profuse.

TREATMENT.—When mercury has been taken into the stomach the appropriate antidotes are sulphur, which forms the insoluble sulphide of mercury; and albumen, in the form of white of egg or milk or curds, which combines with the mercury and forms an insoluble albuminate of mercury. Other treatment would include the giving of sedatives to allay pain and irritation.

Acid Poisoning.

The three mineral acids, Sulphuric Acid or Oil of Vitriol, Nitric Acid and Hydrochloric Acid or Spirit of Salts, are responsible most frequently for acid poisoning. They may be given in mistake for more bland medicines and their poisonous effect is due to their irritant and corrosive action on the lining of the mouth, gullet, stomach and intestines. The discoloration of the parts attacked by the acid varies. Sulphuric acid chars organic matter and imparts a black stain; nitric acid produces a yellow coloration, and acetic acid whitens the tissues.

TREATMENT consists in the giving of large doses of opium preparations to subdue the pain, followed by oil and mucilaginous drenches to allay the irritation. Lime water, soap-water, washing soda, magnesia, chalk or other alkalies should be given as neutralizing agents.

Alkali Poisoning.

Poisoning by Caustic Soda, Ammonia, or Potash should be counteracted by the giving of copiously diluted doses of vinegar, lime juice, lemon juice or other mild acid. The symptoms of both acid and alkali poisoning are similar to those common to other forms of irritant poisoning described above.

Carbolic Acid Poisoning.

Poisoning by carbolic acid or any of the other derivatives of coal or wood tar such as creosote, creolin, phenyle, Jeye's fluid and Macdougall's dip, occurs occasionally through inadvertence in giving one or other of these in mistake for another medicament.

The SYMPTOMS are those of irritant poisoning previously described, and sometimes narcotism with staggering gait and ultimate paralysis. Oftentimes there is exorciation or peeling of the skin of the lips and the mucous membrane of the mouth, and the smell of the poison can be detected in the breath.

The best ANTIDOTE is oil of turpentine given in a large dose (from two to four ounces) in a pint of olive oil. Epsom salts should also be given. In addition to acting as a purgative it combines with carbolic acid and forms phenylsulphuric acid which is devoid of poisonous properties. Demulcents such as previously recommended in irritant poisonings are also advantageous.

Cyanide Poisoning.

Since the introduction in recent years of the cyanide method of gold separation complaints have been received from various districts regarding the poisoning of stock through drinking the effluent water from the cyanide vats. That stock has been so poisoned however cannot be regarded as certain; for, so far as the author knows, the suspicion has never been scientifically investigated; no authentic description of symptoms and *post mortem* appearances have been recorded; and the possibility of the fatalities reported having been due to other causes has not been eliminated.

An appropriate antidote for cyanide poisoning would be the administration of carbonate of ammonia in doses of from one to two ounces dissolved and well diluted with warm water. Ammonia vapour from strong liquid ammonia may also be given as an inhalation. The hypodermic injection of two dram doses of sulphuric ether is a reliable heart stimulant such as is required in these cases.

Prussic acid poisoning will be more properly described when plant poisons are being dealt with.

Brine Poisoning.

Pigs are sometimes poisoned by the drinking of brine or the eating of over-salted meat or salted fish refuse. The poisoning is associated with nervous excitation and spasm; later on partial paralysis, stupefaction and unconsciousness supervene. There is always more or less straining and pregnant sows may abort. Red discolorations of the skin in patches are often presented and are evidences of intestinal irritation or inflammation. Great thirst is a constant symptom.

TREATMENT.—Allow frequent drinks of gruels, boiled starch or gum water. The spasms may be counteracted by chloral hydrate.

(To be continued.)

HARVESTING ON THE SLOPES OF LOVELY BANKS.
Farm Homesteads in the distance.

PROGRESSIVE FARMING.

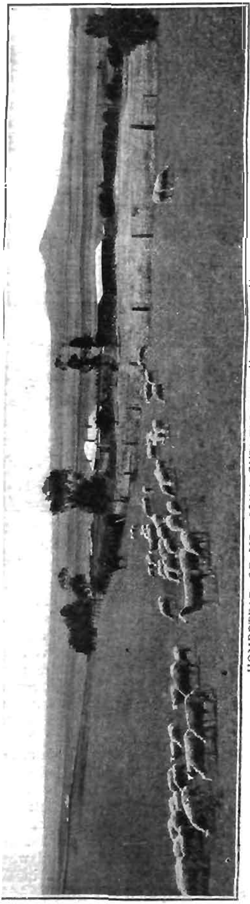
No. 1.—Near Lara.

T. Cherry, M.D., M.S., Director of Agriculture.

In all parts of Victoria the process of subdivision of very large estates is taking place, the resulting type of farming being usually from 300 to 400 acres in extent. On the other hand—and especially in the wheat growing counties—the opposite process is in operation, the original 320 and 640 acre blocks being purchased by successful neighbouring farmers to augment their own holdings. In this way farms of from 2,000 to 3,000 acres are found over large portions of the northern plains.

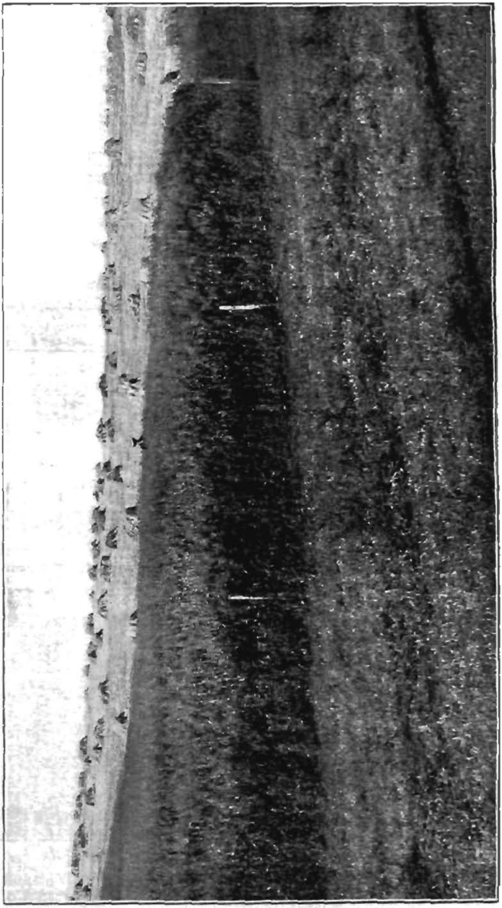
TURNING IN THE STUBBLE.

The development typical of the first-mentioned process of subdivision may be illustrated in many parts of the central counties. Here the reliable climate and proximity of the Melbourne market has encouraged a class of farming approaching what may be called "intense culture." Our illustrations have been taken from Mr. H. M. Sutherland's Elcho Estate, situated about 4 miles north of Lara Railway Station, and 14 miles from Geelong. The soil is partly alluvial and partly volcanic deposits, the former being particularly rich in lime. The gentle slope by which the volcanic plateau rises from the alluvial plains is known as "Lovely Banks." Within the last few years private enterprise and the operations of the Closer Settlement Board have cut up a number of the large estates in this district into comparatively small-sized farms. Where formerly not a single homestead could be seen, comfortable dwellings are now found at intervals of half-a-mile or less. The rainfall averages 22 inches, and while the summer may be long and dry there is seldom any shortage of rainfall in the autumn and spring. Consequently the whole of the land is well adapted for agriculture. The proximity of the Geelong and Melbourne markets makes hay growing as remunerative as in any part of Victoria, while heavy crops of oats, barley, and wheat are also raised. Our illustrations, taken whilst the harvest was in full swing, give some idea of the up-to-date developments.



HOMESTEAD OF MR. JOHN SUTHERLAND, "KIA ORA," LARA.
Flock of Border Leicester Ewes with lambs at foot in foreground.

Steam traction ploughing is perhaps more largely developed in this district than in any other part of Victoria. One great advantage is that it sets free the farm horses for other work, and the accompanying illustration shows the engine pulling two five-furrowed disc ploughs following close on the reaper and binder. Ten acres are ploughed a day, while harvesting operations and turning in the stubble ready for next season's crop are going on at the same time. It will be remembered that this plan of turning in the stubble without a moment's delay after the crop is cut is one of the essential features of dry farming methods in America. While the crop is standing the surface of the ground is to a very large extent sheltered from the dry influences of the sun and wind. A certain amount of moisture is always held amongst the roots of the growing crop. By turning over the stubble at once all the available moisture is conserved, and the land is placed in the best possible condition for receiving and absorbing any stray thunderstorm that may happen during the summer months. The stubble and residue of the crop begin to rot at once, so that plant food for the next season's crop is being prepared all through the hot weather, and finally the land is in a condition to allow of its being seeded early in the autumn. Every condition favorable for next season's success is thus assured. The only disadvantage is the fact that the grazing of the stubble after harvest is lost. The value of this grazing is much less now when the binder is in almost universal use than it was a few years ago, and it cannot be considered in any way equivalent to the advantage derived by ploughing the paddock at once.



OATS FOR SILAGE AND HAY.
Stooks of Mixed Hay Crop—Wheat and Oats—on hill beyond.

Oats are one of the standard crops in all parts of the district. A new variety known as "Banner" oats was introduced by Mr. H. M.

CUTTING OATS FOR GRAIN—40 BUSHELS TO THE ACRE.

Sutherland from Scotland last year. The first season's crop averages over 5 feet in height. The straw is very strong with a large amount of flag, and this variety gives every promise of being very suitable both for ensilage and hay. On the hill behind this view is seen the stooks of a mixed hay crop—wheat and oats—yielding approximately 2½ tons to the acre; another view is of the oat crop being cut for grain, estimated to yield over 40 bushels to the acre.

Sheep on Small Holdings.

With the subdivision of estates the sheep industry has undergone considerable modifications. Small flocks of sheep owned by the small

BORDER LEICESTER STUD EWES, 15 MONTHS OLD.

farmer are rapidly displacing the large flocks owned in former days by the squatter. Since 1906 the number of flocks containing less than 1,000

sheep have increased in number by 5,150, the number of such small flocks having increased from about 14,000 to nearly 20,000. The sheep in these small flocks have increased by 1,420,000 during the same period. At the same time the flocks of sheep over 1,000 in number have increased by 28 per cent., while the number of sheep in them shows an increase of 1,200,000.

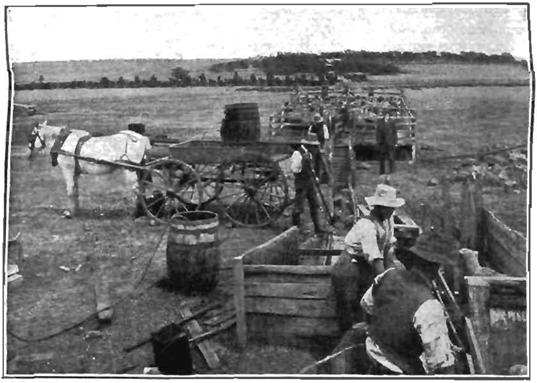
The following table shows the changes in Victorian flocks during the past three years:—

SHEEP IN VICTORIA.

Size of Flocks.		No. of Flocks.	No. of Sheep.
Under 500...	1906	11,647	1,709,472
	1908	15,797	2,415,541
500 to 1,000	1906	2,407	1,671,223
	1908	3,414	2,393,866
1,001 to 2,000	1906	1,112	1,557,476
	1908	1,490	2,130,673
2,001 to 3,000	1906	326	814,763
	1908	411	1,007,456
3,001 to 5,000	1906	213	850,454
	1908	288	1,139,661
5,001 to 7,000	1906	99	581,360
	1908	114	679,493
7,001 to 10,000	1906	82	694,651
	1908	100	864,734
10,001 to 15,000	1906	75	905,966
	1908	79	989,913
15,001 to 20,000	1906	50	867,279
	1908	39	684,469
Over 20,000	1906	56	1,687,478
	1908	52	1,672,158
	1906	16,067	11,340,122
	1908	21,784	13,977,964
Sheep in cities, towns, &c., and travelling flocks	1906	...	114,993
	1908	...	168,770
Total sheep	1906	...	11,455,115
	1908	...	14,146,734

Where a small flock of sheep is kept it is essential that the quality should be right, and that provision be made for properly feeding them in the early spring and during the summer. Whatever breed is kept they should be capable of producing early and quickly maturing lambs so that no complaint can be made by the buyer that the young lambs are backward or of inferior quality. The Border Leicester is extensively bred in New Zealand for the export trade in frozen mutton. They have the reputation of being hardy, possessing a sound constitution, and being great foragers. They mature quickly for early lambs, and on good pastures the wethers are ready for market and command the highest prices at from 15 to 20 months old. Mr. Sutherland has imported a number of Border Leicesters both from New Zealand and Great Britain, and there is every indication that they are well suited in every respect for this class of farm in the south of Victoria.

Our sheep dipping illustration brings out a feature in the back-ground hitherto neglected on most Victorian estates. The fine old plantation of trees surrounding the homestead affords admirable shelter in the centre of



SHEEP DIPPING AT "ELCHO," LARA.

a nearly treeless region, while the young plantation in the intermediate distance indicates how easy it is to make ample provision in this direction if the matter of tree planting is looked upon as a regular portion of farm work.

SOME POULTRY EXPERIMENTS.

H. V. Hawkins, Poultry Expert.

From time to time statements have appeared in various publications, that Leghorns and Wyandottes are pre-eminently the best for all round purposes, and farmers have been advised to keep no other. It is my duty to again point out this erroneous idea. In the first place, locality is of great moment, when recommending breeds. For example, no one who knows anything about the business would urge the farmers in the Buffalo Ranges to keep Leghorns, neither would he be wise to recommend them in many parts of Southern Victoria, for the good reason that they feel the cold weather more than any other breed. The cold has a deleterious effect, and mortality would be a serious factor to reckon with. The Leghorns are peculiarly adapted to the more arid north, and for egg production are equal to any known breed, provided they are rightly selected.

Equally good results may be looked for by keeping Black Orpingtons in the cooler climates. When their second season of usefulness has

passed, they will, by judicious feeding, bring good prices in the market. The flesh of the Orpington is, at 2½ years, much more eatable and succulent. than that of the Leghorn, which is fibrous, dry and tasteless after the second season has passed; in fact, the Leghorn was never intended for the table.

To determine the question, I have during the past few months conducted exhaustive experiments as to the quick maturity of the breeds under review. Attention has also been paid to the all important breed with which we hope to build up an export trade, the Dorking-Game, and which, at the recent World's Poultry Congress, was recognised as being the breed *par excellence*.

DETAILS OF EXPERIMENTS.

Pen.	Breed.	No. of Eggs.	Date Hatched.	No. Hatched.
1	White Leghorn	12	Sept. 21st	10
2	Silver Wyandotte	12	,,	8
3	Black Orpington	12	,,	11
4	Silver Dorking-Game	12	,,	12

The 41 chicks were placed in 4 pens of 30 x 20, each having precisely the same food, viz.: oatmeal, stale bread crumbs, lightly boiled sheep's liver, finely sliced onions, bonemeal and charcoal, with plenty of skim milk to drink; grit and shell always being available. At the end of four weeks, the cockerels were weighed and the following table shows the results:—

Breed.	Age.	Weight.
Dorking-Game	1 month	19 ozs.
Black Orpington	,,	18 ,,
Silver Wyandotte	,,	14 ,,
White Leghorn	,,	11 ,,

At 6 weeks, they were again placed on the scales, when considerable increase in weight was noticeable.

Breed.	Age.	Weight.
Dorking-Game	6 weeks	26½ ozs
Black Orpington	,,	23 ,,
Silver Wyandotte	,,	19 ,,
White Leghorn	,,	15 ,,

A fortnight later, bringing them up to 8 weeks old, they were again weighed and it was found that the increase had been well maintained.

Breed.	Age.	Weight.
Dorking-Game	8 weeks	32½ ozs.
Black Orpington	,,	26¾ ,,
Silver Wyandotte	,,	22 ,,
White Leghorn	,,	18½ ,,

The result of the two months' test clearly indicates that the Dorking and Orpington are two of the most profitable breeds to keep. Whilst the amount of food consumed by each pen was the same each day, the gain in flesh varied considerably. In addition to the rapid increase in weight we must not overlook the fact that both breeds are excellent layers of fair sized eggs, and when bred *early* in the season, are good *winter* layers.

The time is not far distant when 8 to 10 weeks' chicks (broilers) will become as popular here as they are in America to-day.

BALLAN MIXED FODDER CROP COMPETITION.

REPORT TO THE SECRETARY, BALLAN AGRICULTURAL SOCIETY.

H. Ross, Field Officer.

I beg to report that I have inspected the forage field of Mr. H. Vaughan, Ballan, who was the only competitor who entered for the prize offered by your Society. The area of the field is 5 acres and comprises maize, rape, potatoes and prairie grass. *The land is of poor quality and is generally considered not to be fit for cultivation.* It was ploughed this year for the first time.

Two acres were sown with maize, with the addition of ½ cwt. superphosphate, and the crop is making fair progress. A mistake has been made in sowing the maize only about 8 inches apart, thus not allowing room for any intertillage. The potatoes (snowflakes) look very well and are superior in growth to most of the crops in the district; ½ cwt. of superphosphate was used. Prairie and cow grasses have done well: it would appear that this class of soil is well suited to the growth of imported grasses and clover. Two acres were sown in October with rape and thousand headed kale; 5 lbs. rape and 35 lbs. superphosphate were used per acre. The kale is affected by blight, but the rape is making vigorous growth.

The Ballan district being one in which dairying is carried on extensively, it is surprising to find how little provision has been made in the shape of summer fodders. The idea prevails amongst the local farmers that the poorer class of soil will not grow summer fodders or potatoes. With the view of determining for himself Mr. Vaughan has carried out practical experiments in his field which have had *very satisfactory results.*

The dressings of superphosphate appear to me to be rather light and I think that, with a heavier dressing and the addition of a small quantity of sulphate of ammonia, still better results would be obtained.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. All inquiries must be accompanied by the name and address of the writer.

SEASONING TIMBER.—A.K.C. wishes to know the best and quickest way to season timber.

Answer.—To season timber rapidly, cut into as thin planks as possible, stack so as to leave air spaces between, and keep in a warm place with a steady current of air circulating through the pile. Very rapid seasoning (by superheated steam, &c.) usually damages the timber more or less, and needs special apparatus. To rapidly season standing timber, cut when the leaves are on in summer, previously removing a large ring of bark at the base of the stem and the outermost rings of wood (usually 1 to 2 inches deep is enough). Complete the cutting soon after all the leaves on the tree have shrivelled and finish the seasoning of the timber in the usual way. The Forest Department would probably give additional or more detailed information on seasoning.

LEMONS GOING BLACK.—H.H wishes to know the cause of lemons going black.

Answer.—It is due to a fungus consequent upon the trees being attacked by scale insects. Spray with red oil emulsion at a strength of 1 in 30.

BLACK SPOT (APRICOTS).—H.H. asks when to spray apricot trees for Black Spot.

Answer.—Spray with Bordeaux 6, 4, 80 (6 lbs. bluestone, 4 lbs. unslaked lime, and 80 gallons water) when the bloom is coming out and again just after the petals of the flowers fall.

IDENTIFICATION OF PLANTS.—Specimens of plants have been forwarded by various correspondents for identification.

Answer.—1. (A.K.C.).—Woolly Head Clover, &c. (*Trifolium tomentosum*, L.) A native of the Mediterranean and now naturalized in this State. It is an annual affording a small amount of feed but dying down in summer. Of some use in spring on poor soils but not a good clover.

2. (J.M.)—*Calandrin a caulescens*, H. B. and K. One of the Portulaceæ. A native of North America, introduced into this State 30 or 40 years ago. It is only a small annual, and, although it seeds freely, can hardly be classed as a serious weed. It is not poisonous or actively injurious, but is certainly not a good fodder plant. Clean cultivation, root crops, and leafy fodder crops will keep it down.

3. (C.E.R.)—Alsike Clover (*Trifolium hybridum*, L.) It is a good fodder plant, and will grow on soils too sandy for lucerne and too wet for Red Clover, but does not stand drought so well.

4. (J.Y.)—White Mulberry (*Morus alba*). The flowers are unisexual and sometimes one kind only may be borne on a tree, in which case if growing by itself it sets no fruit. On rich moist soils again the plant sometimes runs entirely to foliage.

5. (J.B.)—Chicory (*Cichorium Intybus*, L.) One of the Compositæ. It is an introduced plant which may become a pest if allowed to spread unduly. The seeds are sometimes present in pasture mixture, since it is of some use for grazing, but only on good moist soils. On poor dry ground it soon becomes hard and woody. It is useless to cut for fodder, and when dried the leaves turn black, unless very rapidly dried, and spoil the appearance of hay.

6. (L.J.)—Bladder Campion (*Silene Cucubalus*, Wibel.) An introduced weed widely spread over the Globe from warm temperate regions to Alpine summits. The plant is a perennial, hence the root-stock must be removed from the soil. If the pest is in large quantities the ground should be ploughed and the perennial root-stocks raked together and burnt or treated with quick-lime. In addition, flowering and seeding should be prevented by planting crops which can be harvested early before the weed has seeded freely (early potatoes, &c.), and the field cleaned thoroughly after harvesting. The same effect would be produced by growing a catch crop and ploughing it in early, and later raking off the root-stocks as before. In small patches the plant could be dug up and the roots piled and burnt. It has no appreciable fodder value.

RHIZOME.—A.J.G. asks the meaning of the word Rhizome.

Answer.—Rhizome is the term applied to stems which grow more or less horizontally on the surface of the ground (Indian couch grass, Buffalo grass, &c.), or beneath it (English couch grass, Bracken, Iris, &c.). Such stems are often termed "roots," but the leaves and roots arise from them, even when they are more or less swollen and stored with reserve food materials as in Iris, Bracken, &c. Such stems can always continue to grow if left in the ground, and hence the eradication of plants with root-like rhizome stems is always difficult.

HARVESTING LUCERNE FOR SEED.—W.J. inquires when lucerne should be harvested for seed.

Answer.—The first spring crop of lucerne is usually too dirty with weeds to give a clean crop for seed. The second or third cutting is more likely to be clean. Allow the flowers to turn brown before cutting for seed. The threshing will render the lucerne of smaller service for feed on account of the leaves being knocked off. Some experience is necessary before deciding when to cut for seed, as the crop may mature unevenly. The seed should be well screened before marketing. If there are any patches of dodder in the crop, do not cut the lucerne for seed.

SALTBUSH.—NEMO, who is desirous of experimenting with a plot of saltbush, with a view to providing fodder, asks for names of best species.

Answer.—Saltbushes should only be grown as fodder plants on soils where the conditions do not allow lucerne, clovers, maize, sorghum, or similar good fodder plants to be grown. They are easily eaten out, and have nothing like the

productive capacity of the better fodder plants. Among the more useful species are:—*Atriplex halimoides*, Dod., *A. nummularium*, Lind., *A. semibaccatum*, R. Br., *A. vesicarium*, Heward. Sow in drills when the soil is moist and still warm. If too cold, wait till spring.

TANNING COTTON NETS.—G.C.B. asks *how to tan cotton nets used for covering fruit trees.*

Answer.—Soak the nets first of all in a 1 per cent. solution of formalin for an hour. In tanning them with wattle bark use the bark of the black wattle that has been well dried. Make an infusion of the bark. Start tanning with very weak solutions, gradually increasing the strength. Leave them in very weak solution for two days, then put into a little stronger, and so on for a week. Then for the second week put them in a strong solution. Do not overtan, or else the nets will crack. The process will cover a fortnight altogether.

SILVER WYANDOTTES.—C.J. states that he has a strain of Silver Wyandottes. The cock and two hens were imported by him from England, and their progeny were mated with a cock from a prize-winning strain. In every clutch this year there have been two or three white chicks. He wishes to know whether he could show the latter as White Wyandottes.

Answer.—It is not unusual to get 10 to 20 per cent. of white chicks from Silver Wyandottes. They are termed sports. Many breeds, Silver Wyandottes and others made up rom other breeds much older, throw back. It is quite a common practice to sell or exhibit the sports as White Wyandottes. Andallusians are very troublesome in this respect, often as many as 60 per cent. hatching white and sometimes with black spots. Breeding sports with silvers is not advised, but mate up the whites together and the trouble will be gradually reduced. Dorkings and Old English Game are never troublesome in this connexion, they being the oldest breeds extant.

ERADICATION OF RUSHES.—G.R.H. has a farm of fairly good land, but it is covered with rushes. Most of the land has not been cultivated. He wishes to know how to eradicate the rushes.

Answer.—Drainag. and liming (1-2 tons per acre) to keep the soil sweet, open, and pervious so that the rain goes into it instead of running off, making the top alternately sodden and baked, are useful to keep down rushes, but cultivation with the disc plough and the growth of fodder crops are the only profitable ways of suppressing them. If not too abundant on pasture land the tussocks may be mattocked out in summer, piled and burnt when dry, or if mixed with manure while moist they form valuable compost in time. If allowed to dry they only rot slowly.

SPONTANEOUS GENERATION.—D.W. asks (1) Whether it is necessary to have seed to produce plant life? (2) Whether it is not a fact that different herbs are propagated under atmospheric conditions?

Answer.—No cases of spontaneous generation are known. When Acacias spring up after bush fires the seed have been dormant in the soil, where they may retain the power of germination for 50 or more years. When water plants suddenly appear in a pond or lake the seed has usually been brought by birds. Every known case can be explained without assuming ny spontaneous generation.

FODDER FOR PIGS.—R.A.M. asks what is the best fodder to grow now for pigs.

Answer.—Maize is practically the only green fodder which can be planted now. A regular succession of green foods, such as barley, rape, lucerne, or sugar beet is strongly recommended for breeding sows. Mangolds, turnips, pumpkins, &c., are also good fattening foods. As the young pigs come in, do not allow them to lose their baby fat, but keep them in good condition right from the time they are weaned. To produce fat pigs for market no food is better than crushed barley or wheat soaked in milk or water, topping them up for the last week or two with dry peas and plenty of clean water in a separate trough. Cooked potatoes mixed with barley or wheat also makes an admirable fattening diet, though care should be taken to see that the water in which the potatoes are boiled is drained off and thrown away.

The following are a few useful hints to those interested in pig-rearing:—

Do not make the food too sloppy.
Keep plenty of charcoal in pen.
Put a packet of Epsom salts in the food occasionally.
Castrate pigs at three weeks, not later.
Observe regularity in feeding, and let them out for a run occasionally.

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THE ORANGE IN EASTERN SPAIN.

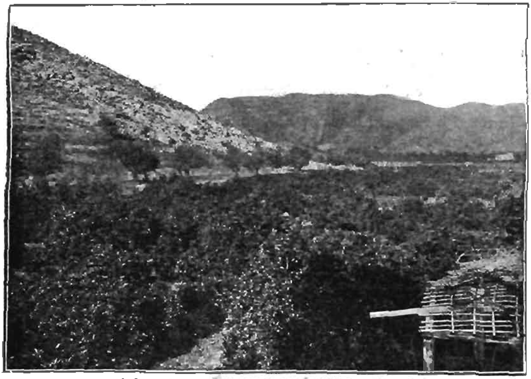
F. de Castella, Government Viticulturist.

In the rich irrigated lands of Eastern Spain orange culture has during the last few decades become one of the most popular rural industries. The vine, the olive, and the algarrobo find their home in dry situations above the level of the water channels, known locally as *Scano*, but the orange is only cultivated in the rich irrigable land which constitutes the *Huertas* or garden plains of which there are several in the region. Wherever the soil of these is free, rich and well drained one is bound to meet with the orange and sometimes also the lemon, though the former tree is by far the more widely cultivated of the two in Spain. The orange is one of the features of the landscape in the Levante, as the Eastern coast of Spain is usually known to Spaniards. Travelling south, from Barcelona, one crosses the Ebro near Tortosa and shortly afterwards orange plantations are to be seen. These become more and more numerous until, near Castellón de la Plana, the whole country side becomes one vast orange grove. The trees, laden as they were at the time of my visit with a heavy crop of handsome fruit, presented a sight not easily forgotten. Here and there other crops displace it, but wherever soil conditions are specially suitable the orange once more occupies the land to the exclusion of other cultures. In this way we have several distinct orange centres, among the most important of which are Castellon, Carcagente, and Gandia, as well as several areas in the Huerta de Valencia itself.

Unfortunately, over production appears to be making itself severely felt and "el desastre naranjera" (the orange disaster) was a frequent heading to local newspaper articles whilst I was in Valencia. Oranges were being sold at the orchards, unpacked, at from 5 to 8 pesetas per 100 kilos, or £2 to £3 3s. per ton. At such prices there can evidently be little profit for the grower, even in a country where labour costs only 1s. 6d. to 2s. per day of over ten hours. I was told on good authority that if the grower cannot get 10 pesetas per 1,000 oranges he loses money. Within the last five years oranges have been worth as much as 28 to 30 pesetas per 1,000; such prices have led to extensive plantation entailing over production, which is to blame for the present unsatisfactory situation.

Apart from consumption in the fresh state, there are no uses to which the orange can be put in Spain. Spanish habits in the way of eatables differ altogether from ours, and marmalade—in fact jam of any kind—is an unknown commodity. The high price of sugar, kept up as it is by a protective tariff, prevents the manufacture of marmalade for export so that shipment in the fresh state is the only outlet growers have for their oranges, and this appears to have been somewhat injudiciously managed in the early part of last season, the enormous quantities shipped at its opening having glutted the market.

It was at Gandia, a small town some 20 miles N.W. of Denia, that I was able to see something of orange culture. The few notes that follow were chiefly made there. They apply, however, to the whole region of the Levante, the same cultural methods being followed throughout. Intense culture is everywhere the rule and it would be difficult to see healthier, finer, or more heavily laden trees.



AN ORANGE PLANTATION IN EASTERN SPAIN.

I arrived in Gandia on 14th January, 1908, bearing a letter to Señor Romaguera, the British Vice-Consul in the town, whom I have to thank for his kind assistance, and for what I was able to see of orange culture during my brief visit. Señor Romaguera drove me, in a galera, a sort of four-wheeled tartana, to see one of the best orchards in the neighbourhood, that of Don José Rausell, situated a mile or so from the town. This orchard covers 500 hanegadas, or about 83 acres, under citrus fruits, chiefly oranges. The whole of it is irrigated, a small portion situated at a higher level than the district channels being supplied by a special pumping plant drawing its water from these. From three to four waterings are usually given per annum, the water being applied by flooding The land is carefully graded and supplied from massive stone channels.

Several different oranges, including a fine "blood" variety, were grown, as well as a good many lemons, but more numerous than any other was the ordinary Valencia, almost oval in shape, known locally as the

Naraja de extraccion or export orange. This is a variety most largely cultivated throughout the Levante.

The lemons were chiefly of two sorts, an early and a late one; the former is said not to keep well. Another variety of lemon, known as "La Reina," was remarkable for its strikingly aromatic fruit.

Oranges and lemons were all planted at 16 feet x 16 feet on the square system. The most remarkable peculiarity in connexion with the cultivation of citrus fruits in the Levante is the system of growing the trees over a hole, with the collar and starting point of the main roots exposed to the air. This system is very generally followed. It was at the Granja Valenciana (Experimental Station and School at Valencia) that I first remarked this curious method, but all the orange trees which I saw subsequently were treated in the same way.

The photograph on this page shows this clearly. The tree is reared, budded, and planted in the usual way, and until about three or four years old is treated much as we would do in Victoria. By this time its surface roots have become sufficiently strong to support it; a hole is dug underneath it and the tap root is entirely cut off with a saw.

SPANISH SYSTEM OF GROWING ORANGE TREES.

By the adoption of this system, the collar and the starting point of the main roots of the tree are exposed to the air.

The hole, which is a foot or so in diameter, and of about the same depth, is not filled up. It remains always open, any dirt or rubbish which may fall into it being regularly removed. When irrigating, which is usually done by flooding, a small dam is made around the tree at a distance of a couple of feet from it to prevent water from getting into the hole. The appearance of these trees is very striking; their bases may be compared to large spiders sitting over holes in the ground. The object of the treatment is to prevent collar rot and gumming (*Mal de Goma*), which used to be prevalent, but now seem to give little trouble. The sour orange stock is the one usually employed, even for lemons; lemons worked on lemon stock are said to be liable to Mal de Goma.

The trees struck me as being very healthy. They were loaded with an abundant crop of fine fruit; in fact, everything seemed satisfactory excepting the price.

CITRUS PESTS.

When in Valencia I had an interesting conversation with Don José Maria Marti, Director of the Granja Valenciana, to whom I am indebted for the following notes:—

FRUIT FLY is not much dreaded by orange growers. It is known in the district, especially in some other fruits, such as the peach, but it appears to only do harm in occasional seasons. It is not nearly so much dreaded as Poll Roig, or even Serpeta, two scale insects which are the orange pests most feared in the Levante. Beyond picking up and destroying wormy fruit, nothing is done to combat fruit fly.

POLL ROIG (pronounced Poll Roch), as it is locally known in the Valenciano dialect, and Piojo Rojo (red louse) in Spanish, is the most dreaded pest; the entomological name by which it is known in Spain is *Aspidiotus lichtiospermum*. This scale is only found in a few parts of the Levante. It has not yet appeared in Gandia.

The most successful treatment is a spray recommended by Don José Maria Marti, and known locally as the "Formula Marti." It is made as follows:—

Heavy oil of tar	3 lbs.
Whale oil	4½ lbs.
Caustic soda	½ lb.
Soft soap made from whale oil	2 lbs.
Water to	22 gallons.

The ingredients should be mixed in the following order:—In a couple of gallons of boiling water dissolve the soda, then the soap, then remove from the fire and add the oil of tar. The whale oil should be added last of all and when the mixture is not too hot. Dilute to 22 gallons before use.

Don José recommends a spraying in August and again in September; also one after pruning, making three in all. He claims that his treatment is as effective as fumigation with hydrocyanic acid, and that it costs one-quarter as much. He finds fumigation dangerous, and is of opinion that only eggs about to hatch are destroyed; those well protected under the scale covering may survive the treatment.

SERPETA is a local name for *Mytilaspis Gloveri*, a scale allied to the lemon scale, *M. citricola*.* It does not appear to do so much damage as the previous one, and can be combated by the same treatment. Several species of *Dactylopius* or mealy bug are also known.

NEGRETTA is the name given to sooty mould, the black fungus feeding on the sugary secretions of scale insects. Should it be troublesome, Dr. Marti recommends the addition of a little sulphate of copper to the formula given above.

PACKING AND SHIPPING.

These constitute the chief industry of the small port of Gandia, in which a large sawmill for the construction of cases testifies to the importance of the export trade. The timber used is chiefly *Pinus maritima* from Galicia, in N.W. Spain. The roughly-squared logs are brought round by steamer, for timber is very scarce in the Levante, though attempts are now being made to re-establish forests.

Specilization is the rule here, as in other parts of Spain, and all oranges grown near Gandia are shipped from that port, even those grown

* See French, Handbook of Destructive Insects of Victoria, Part II., p. 85.

near Denia are sent up to Gandia for shipment in the same way that the few raisins grown near Gandia are shipped from Denia.

The photographs reproduced give some idea of grading, wrapping in paper, packing and forwarding of oranges.

The system of packing and variety of packages used appear at first sight very confusing to an outsider. The most usual case for oranges

GRADING ORANGES FOR EXPORT.

is a large three-compartment one, capable of holding a variable number of fruit. Oranges are carefully graded, and the number contained in the case is stencilled on its end, thus we see on the wharf cases marked 420, 700, and even 1,200, but the cases themselves vary in size. The large cases are very tightly packed, the cover being slightly bent in nailing

WRAPPING AND PACKING.

instead of being flat, giving the top of the case a characteristic curved appearance as seen in the photograph on this page. A case to hold 90 kilos of oranges costs 1.75 pesetas to put it f.o.b. on steamer. All

charges (case included) would come to about 5 pesetas, or 4s. Mandarins are differently packed to oranges; as compression would damage them, they are put up in shallow trays, or flat cases, sixteen of which are usually made up into one large crate by means of laths nailed to the sides. Mandarins are graded, and the diameter of the fruit in millimetres is stencilled on the case; we thus have crates marked as 65 m/m or 50 m/m. All cases are supplied from the sawmills in the form of boards of cut lengths; they are nailed together by the packer, to whom the fruit is brought by the grower.

Oranges are sold either by the thousand or by the arroba of 12.78 kilos (28 lbs.), from 88 to 112 oranges going to the arroba. Unless the grower can obtain 3½ reals (equal to 87 cents) per arroba, or 10 pesetas per 1,000, he does not cover expenses. According to advices received from Mr. Harker, H.B.M. Consul at Valencia, since my return to Australia, the orange situation was improving somewhat, and a more hopeful view of the situation was taken than a few months previously, when matters were so critical that the Spanish Government had been induced to remit the Excise duty of 15 centimes (1½d.) per case which had, the previous year, contributed 200,000 pesetas (£8,000) to the revenue.

VITICULTURE IN THE LEVANTE.

F. de Castella, Government Viticulturist.

The Levante is the name given in Spain to the eastern coastal portion of the peninsular south of the Ebro. It comprises the provinces of Castellón, Valencia, Alicante and Murcia and constitutes a region which from several distinct points of view differs a good deal from the rest of the country.

The climate is mild—even more so than in the celebrated Riviera of Southern France. Though snow is not unknown, as witness the fall near Denia, of which a photograph was reproduced in the January issue of the *Journal*, such an occurrence is exceptional. The date palm thrives and ripens its fruit; at Elche (province of Alicante) these palms are grown on a commercial scale. The Levante justifies the title frequently bestowed on it of the garden of Spain, and so far as climate is concerned strongly reminds an Australian of his native land.

The region consists of a long strip of land of varying width, between the high rocky hills which form the supports of the central plateau of Spain, and the sea shore. It comprises three distinct types of soil as follows:—

1. Rich, irrigable level land.
2. Undulating land above the water channels and intermediate between the irrigable land and the rocky hills.
3. High rocky hills, mostly unfit for cultivation.

It is the second category which concerns us here, as it is in this non-irrigable land that the vine is almost exclusively cultivated. The first division will be dealt with in a separate article devoted to irrigation, which is very extensively practised for cultures other than the vine.

One is struck by this fundamental difference between Australian and Spanish methods. In Victoria we have large areas under irrigated vineyards in such places as Mildura and the Goulburn Valley, whereas in Spain the vine is confined to land of what is known as the "secano" or non-irrigable type, the areas of rich soil to which water can be applied

being made to grow oranges, tomatoes, onions, fodder plants and the numerous other products which will be dealt with in connexion with irrigation problems. The vine is limited to land that cannot be utilized for such crops. Together with the olive, the algarrobo, and the almond, it is exclusively to be found in the dry but deep soils in which none but deep rooting plants can be depended on to give satisfactory results.

No doubt in such a climate as that of Mildura, without artificial watering the vine could not be cultivated, whereas in Eastern Spain the rainfall is fair. For the ten years ending with 1896 the average annual rainfall in Valencia amounted to 20 inches. Being a coastal town, the atmosphere is moister and consequently evaporation is less active than in inland Victoria.

The limiting of vine culture to land essentially suited for the vine, though often of little use for other crops—excepting, of course, the olive, almond and algarrobo,—is an almost invariable rule in Eastern Spain. When grown on land rich enough for wheat and, in a still higher degree, on irrigated land, quality falls off to an extent, more especially in the case of wine, that the increased yield is not able to compensate for.

This point is worthy of serious consideration by intending planters in Victoria. It is one which has not always received sufficient attention in the past. Some of our vineyards have been established in a haphazard way with little consideration as to the suitability of the land for vine culture. Unless soil conditions be such that quality and quantity may be combined in the highest possible degree success cannot be logically expected. One of the most precious qualities of the vine is to enable use to be made of soils of little value for ordinary farming—deep friable land, often, where its powerful roots enable it to thrive but where cereals &c. give poor crops. We thus find, in Spain, the vine running up mountain gullies or up the sides of hills in company with other deep rooting plants, leaving the rich flat land to crops demanding more fertile soil.

The rich irrigable land is chiefly to be met with where rivers or creeks empty themselves into the sea. It is therefore somewhat limited in extent, whereas that of the secano type is far more prevalent. We thus find vine culture to occupy an enormous area. The following statistics, showing the area under vines and olives as well as the quantity of wine and oil harvested in each of the four provinces that constitute this region, are instructive:—

VINES AND OLIVES IN THE LEVANTE IN 1906.

Province.	Acres under Vines.	Wine made.	Acres under Olives.	Oil made.
		gallons.		gallons.
Valencia	260,980	21,000,000	79,375	1,072,698
Alicante	250,000	15,400,000	41,250	74,140
Castellón	127,825	9,600,000	72,335	207,152
Murcia	76,300	9,600,000	61,120	160,820
Total	715,055	55,600,000	254,080	1,514,810

The above figures do not include raisins made, amounting to somewhere about 30,000 tons.

It will be thus seen that viticulture is the most important rural industry in the Levante. So far as area under vines is concerned, it is *the most important of the thirteen regions into which Spain is divided.*

Cataluña, in the North-East, produces more wine. The three regions of Levante, La Mancha and Cataluña possess between them 1,879,495 acres or more than half the area under vines in Spain (in 1906).

Phylloxera has appeared in each of the four provinces which were officially declared to be phylloxerated in the following order:—Murcia in 1874, Alicante in 1900, Castellón in 1901, and Valencia in 1905. Large areas are as yet free from the insect (Denia and the raisin districts for example). The distribution of the vine lands, running as they do up valleys, separated from one another by large extents of barren rocky hills, or by areas of rich irrigated land in which vines are not grown, retards to some extent the free spread of the invasion. Nevertheless, there are several important outbreaks in the province of Valencia, the one I was able to see most of, and the spread of the pest to all vineyards is merely a question of time. Though the most recently attacked of the four provinces, it is Valencia that is taking the most active steps to combat it and to aid growers in the work of reconstitution. Viticultural work in this region is in the hands of Don Rafael Janini y Janini, another charming and highly trained Spaniard—a man of the same type as Don Nicholas de los Salmones and Don Victor M. de Zuñiga who are doing such good work for their Government in connexion with the reconstitution in Navarra and La Rioja. Don Rafael is, in addition, entrusted with the management of the Royal vineyards, the private property of the King. On 12th January I arrived in Valencia from Barcelona. Don Rafael being absent, I went on to Denia, a description of which place and its raisin industry, appeared in last month's *Journal*. I got back to Valencia on 17th January and was pleased to find that Don Rafael had also returned. He received me most cordially and gave me much valuable information concerning viticulture in this most important region of Spain.

Unfortunately, the few days I was able to spend in Valencia were marred by continual rain, which rendered it very difficult to get about; I was frequently able, however, to call on Don Rafael and from him to collect information as to the work the Government is doing in connexion with reconstitution. He does not share the views of Don Nicholas de los Salmones as to the propagation of grafted rootlings being outside the province of the state. He is taking active steps to meet the demand for grafted vines which he is propagating on a large scale and supplying to growers at £5 per 1,000. During the 1907 season 300,000 grafted rootlings were raised, and at the time of my visit arrangements were being made for the grafting, callusing, and striking of over half a million cuttings.

Operations on such a scale have necessitated the raising of considerable quantities of resistant wood. In order to obtain these cheaply and with the least possible loss of time, grafting on old viniferas, not as yet suffering from phylloxera, has been largely resorted to. Fears were at first held in some quarters lest cuttings from such grafted vines might not suffer some change, especially in the direction of loss of phylloxera resistance. Don Rafael is altogether reassuring on this point in a recent report wherein he states—

> As the well-known French vine authority, M. L. Ravaz, said to me a few months back—"You may feel perfectly secure. The scion is in no wise modified by the stock, and American vines grafted on viniferas are as resistant as those taken from American stocks" (*on their own roots*).*

* This example has been followed in Victoria. The Agricultural Department has leased an area of old viniferas at Château Tahbilk, which, grafted this season, are rapidly producing a large quantity of resistant cuttings.

CALLUSING BY ARTIFICIAL HEAT.

In Valencia I was much impressed with the importance of the modern methods of grafting which have recently been introduced from France with the most satisfactory results. This method, which I have already referred to in my second report, is the one usually followed by the large nurserymen of the South of France. It was practised on a large scale prior to 1898 by M. F. Richter, the well known nurseryman of Montpellier, who generously described the process, giving full details, in *La Revue de Viticulture* of 16th April, 1898. M. Richter is the inventor of the process which is usually known as Moss Callusing, as the grafted cuttings were at first callused in cases lined with moss. Suitable moss being often hard to procure, washed seaweed was substituted for it and has proved more satisfactory, chiefly in the direction of freedom from moulds and other fungus growths which were prone to develop in moss.

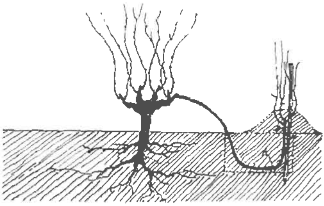
The system, which will be described in detail in a later issue, may be summarized as follows:—The grafted cuttings are packed in cases capable of containing about 1,000 grafts each and separated from the sides and bottom in the case by a layer of seaweed about 4 in. in thickness. The grafts are very carefully placed in position, a little clean pine sawdust being filled in between them at their base. Tying is dispensed with, being unnecessary, and even slightly injurious as it interferes to some extent with the formation of callus.

While being filled the cases are placed on one end, the grafts being packed in horizontally. When filled the case is up-ended so that the grafts assume their normal, vertical position. The cases are then saturated with water by means of a watering can and placed in an artificially heated room, kept at a temperature of about 75 deg. At the end of about a fortnight callusing is complete and after being hardened off at the ordinary temperature the grafts are planted out in the nursery in the usual way.

The graft adopted in the Government nurseries is the whip tongue, which is practised exclusively. Machines have been abandoned as giving a less perfect union. Don Rafael engaged one of M. Richter's foremen to initiate the system in Valencia. He spoke most enthusiastically of the results obtained the first season, and looked upon the method as a complete solution of the grafting problem. In his opinion field grafting, which had hitherto been largely practised in Eastern Spain, would have to give way to the use of nursery raised bench grafts—an opinion which is not universally shared by his countrymen, especially in the south, as we have already seen. There is no doubt, however, as to the excellent results obtained and the superiority of the method over all other systems of callusing. As Don Rafael points out, it is moss callusing, with the aid of artificial heat, which enables the substitution of bench grafting for field grafting, a change which would not otherwise be financially possible.

A method of reconstitution which is decidedly interesting was brought under my notice by Don Rafael. It is known locally as the Injerto Vidal (Vidal's graft) after the name of Don José Vidal who has practised it on a rather extensive scale. The aim of this system is to permit reconstitution of vineyards, as yet undamaged by phylloxera, without the loss of time entailed by eradicating and replanting. The accompanying diagram will give an idea of the method.

A deep layer is brought down from the European vine it is intended to replace, into the end of which is grafted an American cutting. This cutting, supplied as it is with sap from the vine bearing the layer on to which it is grafted, makes very vigorous growth so that towards the end of the summer following, it can be bud grafted with the European scion desired. Fruit will be produced the following year. As soon as properly established the young vine is separated from the layer at the point marked A. The original vines are eradicated and one would thus have a grafted resistant vineyard, almost without loss of crop. Attractive as the system is in theory, things do not appear to work out so well in practice and, although tried on a fairly large scale by Don José Vidal, he has since found it pays better to root out and replant in the ordinary way, that is, either with Barbados to be field grafted later or with nursery raised bench grafts.



VIDAL'S GRAFT.

As regards stocks the same ones are to be met with as in Navarra and La Rioja. So far as they are concerned there is nothing very novel to report, except perhaps that Don Rafael is less severe on V. Riparia as a stock than some of his countrymen. In deep fertile "Riparia soils," particularly if they be free from excess of lime, he considers V. Riparia to be a stock of value.

As regards scions, the chief varieties used are Garnacho, Maseguera, Monastrell, Forcallá, and the various other red varieties, common to northern Spain for the production of rather full bodied wines. For the wines of the Levante are amongst the heaviest blending wines in Spain.

One variety peculiar to the region deserves mention and may possibly prove a valuable introduction to Australia. This is the Bobal, a heavy bearing sort producing a fairly full bodied wine. This variety had already been mentioned to me by Don N. de los Salmones in Pamplona as being superior to the French Aramon as a quantity sort. Don Rafael, in answer to my question, explained that it is very difficult to adopt to its surroundings and that only in a few localities does it find itself at home. In the neighbourhood of Requena, in the hills above Valencia, it is cultivated to the exclusion of nearly all other sorts—here it gives heavy crops of good wine. Remove it from its home and quality suffers whilst the yield is no longer sufficient to render its cultivation profitable. Possibly we might find a district specially suited for it in Australia, our climate being so similar to that of Span. At any rate its several good qualities in a locality which suit it should make it certainly worthy of a trial

I paid a visit to Utiel, a rather important wine growing centre some 50 miles inland from Valencia. The railway passes through Chiva and Cheste, to other centres now in active reconstitution, and where the Diputacion (local assembly) has established important nurseries for the propagation of grafted rootlings. The country is most picturesque, the line following a rough valley most of the way with stretches of undulating stoney land of varying extent suitable only for vines, olives, &c. The vine especially is very much in evidence.

STREET SCENE IN UTIEL.

Several large wineries are to be found in these viticultural centres, the growers usually selling their grapes to them. High temperature during fermentation, high gravity of the must, and deficient acidity are frequent causes of trouble, but up-to-date appliances have come into general use and enable these difficulties to be overcome. In these wineries very thorough crushing of the grapes is brought about by special and energetic machinery, it being considered necessary to thoroughly crush so as to completely empty the berry in order to obtain a rapid fermentation. Grenache or Garnacho, grown on some of the hillsides, yields wine containing nearly 30 per cent. of proof spirit.

Since the French market is closed to the wines of this part of Spain, owing to her own production having overtaken her requirements, matters viticultural are very much depressed and much of the wine is now turned into spirit. In Utiel, for example, there are no less than 27 distilleries. Formerly these strong wines were largely shipped to France for blending purposes. Nevertheless, reconstitution is being actively pushed on with, growers having confidence in the future and finding it difficult to turn their hillsides to better advantage than vine culture, even at the low prices now ruling.

Shipment of Fresh Muscats from Benicasim.

A small local vine industry which is of interest is the cultivation of Muscat grapes for shipment in the fresh state from Benicasim, a small

town on the coast some 50 miles north of Valencia—another instance of Spanish viticultural specialization. Here the vine zone is narrow, for the rocky hills are close to the shore. The soil is a rather special one, a light reddish soil resting on a stiff clay at a depth of a few inches. In such a soil, and in such a dry situation, the grapes though not large have a thick golden skin and excellent flavour. They are able to stand packing far better than is usual with Muscats, for the Moscatel grown here is none other than the Muscat of Denia which appears to be identical with the one we grow here under the name of Gordo Blanco.

The fruit is gathered between the 20th of July and the middle of September. Large quantities are sent to Paris in baskets. It would appear that there is a future for the shipment of some of our Gordos in the fresh state. For such a destination they would no doubt require to be specially grown—planted in dry situations and not irrigated too short a time before maturity. Without going into the question of the possibility of landing properly grown Gordos in Europe, there should be a large demand for this class of fruit in India, China and Japan, as well as in New Zealand.

M. Poirier has an article on the Benicasim grape trade in *La Revue de Viticulture* of 26th November last. He describes how water is stored for the use of the vine by the opening of trenches to be filled with vine prunings and also manure, rubbish, &c.—a practice I observed in different parts of Europe.

THE FRUIT CASES ACT 1906.

J. G. Turner, Senior Inspector, Fruit Exports and Imports.

This Act, although it has been over two years in operation, is only now being put to a thorough test. In some respects it has been copied from the Tasmanian Act, but it differs from that Act chiefly in the fact that the local measure provides for the marking of the cases with the maker's name, address and guarantee. It is around this particular section of the Act that, at the present time, so much controversy is raging. A large number of persons have been reported to the Department for exposing for sale fruit in cases which, although of the standard size, were not marked with the maker's name, address and guarantee. Some of these offenders have already been prosecuted and fined and it is expected that others will be shortly dealt with similarly.

The committee (representing the fruit-growers, retailers, patent case-makers, &c.) which was responsible for the recommendations made to the Minister concerning this measure, foresaw that unless sections were introduced into the Act making it compulsory that the maker's name, address and guarantee be stamped on every case, there would be little use in expecting uniformity of size. The official view coincides with this. It is obvious that if no visible and easily-understood standard of measurement be shown on every case, buyers and sellers will conduct all their business by guess-work, rather than by foot-rule measurement, and the result will be that things will soon drift into the old haphazard method of former days.

Concerning certain sections of the Act, a period of two years was allowed so as to enable dealers and others to dispose of irregular-sized cases. During that period such cases could be freely exchanged provided that the weight of the contents had been marked on the outside. Upon expiry of the time of grace (28th December, 1908) no cases, other

than those of the standard measurement, would be allowed sale. But, despite oft-repeated warnings, many of the dealers and growers have now found themselves with hundreds of contraband cases thrown upon their hands. The Act prohibits the sale of fruit in such cases and the owner is confronted with the option of passing them on to others at the risk of prosecution or destroying them at a loss. This awkward position applies also to the vendor who finds that many of his cases which were carefully branded with so-called "indelible" ink, now show no trace whatever of the brand, exposure to sun and rain having done their work, and the case is now innocent of any maker's name, address or guarantee.

In order to get over some of these difficulties, which, after all, are only of a transient nature, the Minister for Agriculture has agreed, pending the amendment of the Act, to permit the holders of unmarked standard cases to stamp the guarantee themselves upon each end of such cases. This will remove much of the trouble, but persons who take upon themselves this responsibility will do well to remember that they will be held liable should their guarantee be wrongfully or falsely applied. Cases that are under the standard size may be disposed of by shipping them to other States where similar legislation is not in existence.

In instances where the marking has become indistinct by exposure to the weather or has become defaced by accident, no action will be taken if the examining inspector is satisfied that the cases have been branded at any time with the required maker's name, address and guarantee—provided, of course, that such cases are of the standard sizes.

A liberal allowance is made for shrinkage on second-hand cases, viz., 5 per cent. on the cubical contents; but many instances have come under the notice of the Inspectors where cases, although bearing the maker's name, address and guarantee, have been much below the standard allowed by the Act. Makers are reminded that penalties are provided against persons placing an untrue or incorrect guarantee on cases. Some makers have protested that these provisions are somewhat unfair to them, as it is possible that purchasers of cases bearing the name and guarantee may cut them down to below the size after purchase. In answer to this it may be pointed out that the makers are protected in this direction by the heavy penalties provided against persons altering the size of or tampering with cases bearing the name, address and guarantee of a maker. These penalties are so heavy in fact, including as they do long terms of imprisonment, that it is unlikely many vendors would be found with sufficient hardihood to take the risk.

It has been pointed out in many quarters that the problem of deleting from circulation the numerous old and undersized fruit cases now in existence will never be properly settled until some measure is passed by the Legislature regulating the sizes of cases for the sale of potatoes and onions, or which will prohibit their sale in cases altogether. Many growers and fruit merchants have asked that these commodities be included in the Fruit Cases Act, but the Crown Solicitor has advised that this is *ultra vires*.

The following are the standard sizes of cases prescribed by the Act for the local sale and export of fruit:—

For local trade.—1. Double or two-bushel cases:—26 x 12 x $14\frac{1}{4}$ inches (4,446 cubic) inside measurement and clear of divisions.

2. (*a*) Single or one bushel cases:—26 x 6 x $14\frac{1}{4}$ inches (2,223 cubic) inside measurement and clear of divisions; or

(*b*) 18 x $8\frac{7}{8}$ x 14 inches (2,237 cubic) inside measurements and no divisions allowed.

3. (*a*) Half or half-bushel cases:—26 x 6 x $7\frac{1}{8}$ inches (1,112 cubic) inside measurement and clear of all divisions; or

(*b*) *18 x 7 x $8\frac{7}{8}$ inches (1,119 cubic) inside measurement, no divisions* allowed.

For export trade.—See 2 (*b*) and 3 (*b*) above.

THE ORCHARD.

James Lang, Harcourt.

Gathering and marketing the fruit will take up a good deal of time now, and will continue to do so for the rest of the season. The plum crop has been disappointing this year; in most districts there has been a shortage. Pears are a good crop generally, especially Williams' Bon Chrêtien. The export of apples and pears will commence this month, the first shipment leaving on the 10th. It is almost certain that the quantity available for export will be much larger than in any previous year since the business started.

In packing apples for export, great care should be taken to see that the fruit is sound and free from disease, especially bitter pit. Numerous complaints have been made by the London brokers during past seasons about the bad condition of many shipments, bitter pit rendering them almost unsaleable. In selecting apples for the first shipments, those varieties which mature early should be given the preference, such as Cox's Orange Pippin, Cleopatra, King of the Pippins, Dumelow's Seedling, and Munroe's Favourite, the latter when they are of a good size. Gravenstiens also may be tried, if picked very green; good returns were received from this variety two years ago. The foregoing are all good varieties for early shipment, and are not so likely to develop bitter pit as some of the later sorts.

There is always a good market for pears provided they arrive in good condition. The shipping companies are now taking more care of this fruit than formerly; separate cool chambers are set apart for pears, and a much lower temperature is maintained during the voyage. During the last year or two pears have, on the whole, arrived in much better condition than in previous years. The varieties that so far have carried best are Winter Nelis, Josephine d'Malines, Beurré Clairgeau, Glou Morceau, Vicar of Winkfield and Forelle. Winter Nelis being the best. The last-named pear seems to suit the demand in the London market and is becoming quite a favourite with the buyers.

Another spraying for Codlin Moth should be given this month. Where the regular spraying of the orchard has been attended to, very little of the moth is observable. On many trees it is difficult to find a grubby apple, and in a great many orchards where the spraying has been done regularly and effectively not more than 5 per cent. of the fruit is affected. If all orchardists were to carefully and effectively spray their trees, the moth would be so reduced in number that it would no longer be a menace to the fruit industry. Fallen apples affected with the grub should be gathered up regularly and destroyed.

Citrus trees should not be allowed to suffer from want of water; a good soaking should be given now and again as required.

Budding of fruit trees of all kinds may still be done during the month.

MANAGEMENT OF PULLETS DURING AUTUMN AND WINTER.

H. V. Hawkins, Poultry Expert.

CLEANING PENS.—When the cold nights begin to come—about the end of March—it is time to bring the pullets into their winter quarters. They should then begin to show signs of maturity. Prior to penning them, clean up the pens thoroughly, disinfect the sleeping quarters, renew perches, close up all crevices and cracks, see that the floor is level, and cover it with sand or gravel; also place a board under each perch so that the droppings may be easily removed and the floor kept perfectly clean.

FEEDING.—The question of feeding is very important. During the spring and summer the pullets will have had an abundance of green grass, seeds and insect life. This being so, suitable substitutes must be provided, adding to, rather than reducing, the quantity of animal food they have been accustomed to get in the shape of insects. If skim milk can be obtained at a reasonable price, or is available on the farm, it will be found excellent food. Very often one can secure green bone and scraps of waste meat from the markets at a reasonably low cost. Any of these, provided they are fresh, may be utilized, as well as kitchen scraps. No one should be guilty of feeding decayed meat to poultry. Good prices for fresh eggs cannot be expected if fowls eat putrified food of any kind. The green food may be supplied in the form of chaffed lucerne, clover, or beets, and a little raw onion; boiled potatoes may occasionally be added to the morning ration.

Morning.—I am strongly of opinion that the morning meal should consist largely of pollard, 2 parts (by measure); bran, 1 part; with 1 lb. at least of animal food (lightly boiled) to 30 pullets daily. A fair amount of green food should be added and mixed well, and the whole should be thoroughly worked up to a crumbly consistency.

Should some of the pullets appear backward in their adult feather production, a teaspoonful of linseed per bird in the mash will have beneficial effects.

Evening.—Half an hour before roosting time, give a good handful of mixed wheat, short oats, and crushed maize—equal parts. Scatter the grain in dry litter, and make them work, as it helps to promote egg production.

There is great variety in thus feeding, and as eggs are usually worth 2d. each in April and May, it pays to pen in small yards, protected from cold bleak winds and provided with comfortable houses. Well-fed pullets so treated will net at least 6s. profit per bird.

SHELL, GRIT, AND WATER.—Ground oyster shell has no equal for the production of firm egg-shells. Each pullet will annually consume 7 lbs. Provide a box with plenty of sharp pieces of grit, such as gravel and broken crockery. The addition of charcoal and crushed burnt bones twice a week will be found beneficial. Keep the water vessel always full; clean out daily and place in a sheltered spot.

NEST BOXES.—Encourage the pullets to lay in a secluded corner. Make the nests dark and inviting. Do not allow them to lay in the house. Shun all bad smelling disinfectants, as the eggs, being very porous, may easily become tainted; for example when the nest has been sprinkled with carbolic powder or other similarly strong deodorizer.

EGG YIELD.—Bear in mind that the real cost of eggs can only be estimated by the quantity harvested. You cannot expect a large egg yield by feeding the stale loaf to your pullets.

SELECTING LAYING STOCK.

H. V. Hawkins, Poultry Expert.

There are a great many methods advertised in various pamphlets and papers stating that, if you will practise this or that method of selecting as laid down in the paper, you will be able to determine the drones from the workers. The writer has tried a few of these so-called certainties, and has come to the conclusion the trap nest is the only accurate test. It is by selection and keeping records, that advancement is made along this line.

Each hen has her own individuality, *i.e.*, certain hens lay eggs that are in nine cases out of ten hatchable. Some hens lay well, but, although their eggs are usually fertile, they will not hatch whether set under a hen or placed in the best incubator. The chicks develop to a certain size, in many cases being fully formed, but die in the shell. Again, many hens lay eggs that are seldom fertile.

In selecting birds one has several objects. The saying "that the hen that lays is the hen that pays" is often heard. The majority of those engaged in the poultry business consider egg production the best end of the business. It is often the surest. There is not the same amount of risk attached to it. At the same time, if people are foolish enough to believe that Mr. So-and-So can supply eggs from hens, tested by the so-called new system, which have produced 300 eggs per annum they have more faith in the advertiser and the hen than the writer has.

There is no doubt that certain characteristics should be looked for in a good laying hen. She should be low set, and stand on a pair of shanks fairly wide apart. The head should be nice and clean cut with a *full* bright eye. In other words, hens should show feminine character and not wrinkled and sunken features. Hens of the latter type should be discarded; in short, masculinity in the hen is a bad sign. A hen with a large capacity for food, *i.e.*, has a large crop (*craw*), is usually a payable bird to feed. The smaller the sack of food she takes to roost at night the fewer eggs will she produce. Dairymen know that a cow must have plenty of room for food, in order to produce a large milk yield.

The advertised systems serve one purpose, viz., by examining the lay bones the amateur knows which bird is about to lay, or is laying. Should the lay bones be relaxed to the extent of about three fingers (closed) the bird is laying; if they are almost in contact, that is the hen to market, but so much depends on the time of year one wishes to sell table fowls.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page* 32.)

XVII.—Reproduction—*continued.*

LACTATION.

The mammary glands vary in number in different animals. In the cow there are really two, for the udder, though apparently single, is divided completely by a fore and aft partition of strong connective tissue which completely separates the two glands. Each gland has one or more main ducts and teats. The mammary glands increase in size at puberty but such increase is largely due to connective tissue and fat. When, however, the animal becomes pregnant the true glandular matter undergoes great increase. This response of the mammary gland to pregnancy has been proved to be due to hormone stimulation, but a doubt has arisen as to the origin of the hormones. Probably such origin is twofold—from the ovary and from the fœtus. In an animal in the wild state no secretion of milk takes place, except when suckling, but, in domesticated animals, milk secretion may occur throughout pregnancy and even in the virgin state. Certain evidence points to the fact that from the fœtus or its placenta a hormone enters the blood stream which, reaching the gland, holds secretion in check. The moment the placenta is detached this restraining agent is removed and the gland begins to secrete actively. In the highly selected and domesticated milch cow pregnancy does not stop the formation of milk though it certainly lessens the amount secreted in the later months.

The mammary gland is a true gland and its product a true secretion. The chief ingredients of milk do not appear preformed in the blood but are manufactured by the gland cells out of the nutriment supplied by the blood. In one respect the secretory epithelium of the mammary gland is unique. The lining cells, when active, not only produce a secretion but apparently break up, in whole or part, and pass into the secreted fluid. Milk is to a certain extent a cell pulp as well as a fluid secretion. The cells that are thus mutilated or lost are speedily repaired or replaced by cell growth and subdivision. The mammary gland has a fine substructure of connective tissue, embedded in the meshes of which lie the true gland cells. It is plentifully supplied with blood vessels, lymphatics, and nerves. The ducts leading from the small gland follicles or *acini* join together to form larger ducts, and so on until one or two large ducts are formed which pass each through a teat. One peculiarity of this duct system is the presence of reservoirs, the largest being just at the root of the teat. Another curious and important fact is, that in the branching part of the duct system, sphincter muscles occur over which the animal has some control. The teat is also well supplied with sphincter muscles. Closure of the ducts can occur reflexly through fright, unfamiliar surroundings, or œstrus, but it is certain that cows can acquire a pernicious habit of voluntarily holding their milk on the slightest provocation. In some cows the sphincter of the teat is so toneless that the mere pressure of the milk in the udder is sufficient to force it open. If milk is allowed to stagnate in the ducts and their reservoirs there is a partial back absorption of some

of the ingredients; such milk tends to check further secretion and may induce inflammatory trouble through irritation. The secretion of milk is not under the control of the will but can be affected by the physical and mental state of the animal. Thus the quantity will diminish through sexual excitement, fatigue, insufficient food or water, &c. The secretion of milk becomes very active when the calf is sucking, and even during the act of milking. In consequence the milk gained by the calf or milker may be more than that simply stored in the ducts and reservoirs.

PHYSICAL CHARACTERS OF COW'S MILK.

The average specific gravity of cow's milk at 60 deg. F. is about 1,032, that is to say, 1,000 volumes of milk would weigh as much as 1,032 volumes of water at the temperature specified. As the fat in milk has a specific gravity lower even than water it follows that the specific gravity of separated milk is higher than that of whole milk. The white colour of milk is due partly to the fat being in a state of emulsion and partly to the caseinogen of the milk being to a slight degree also in a state of suspension. The yellowish tinge is due to a pigment associated with the fat. The sediment present in uncontaminated cow's milk is very slight in amount and is composed of fibrin threads which have formed in the milk itself and epithelial cells shed by the lining membrane of the ducts in the udder and teat. During the colostral period (lasting a few days after parturition) milk contains cellular elements—colostral corpuscles—which represent the débris of incompletely broken-down gland cells. Fresh milk is slightly acid to some indicators owing to the presence of phosphates and caseinogen.

CONSTITUENTS OF MILK.

1. Caseinogen. This is a complex protein containing phosphorus. It is an acid and is insoluble in water. In milk, however, it occurs as a salt of lime which is soluble. When acid is added to milk, or if the milk develops lactic acid on standing, a clot is formed which is due to the added acid seizing upon the lime and turning the insoluble caseinogen out of combination. When milk is subjected to the action of a protein-splitting ferment such as rennin, trypsin, &c., a totally different form of clotting occurs. The caseinogen is altered chemically being transformed into casein and cannot be restored to its original state. Caseinogen in solution as salt is not precipitated by boiling but it forms a tough skin on the surface. The whole of the caseinogen in milk is not in solution; part is in suspension unattached to lime and thus the white colour of separated milk is produced. Caseinogen is soluble in alkalies and in strong excess of acids, but it is insoluble in weak acids.

2. Lactalbumen. This is a true albumen being coagulated by heat. It differs only slightly from the albumen in blood. In colostral milk the content of lactalbumen is very high and the milk will, if heated, form a firm clot.

3. Fibrinogen. A very small amount of fibrinogen is present which undergoes spontaneous transformation into fine gelatinous threads of fibrin.

4. Fat. Milk contains a mixture of fats, each being composed of a fatty acid and glycerine. The preponderating fatty acids are oleic, palmitic, myristic, and butyric. The fat is held in suspension in the form of microscopic globules each surrounded by a jacket of precipitated caseinogen. When milk stands the globules rise to the surface as cream. This action, as is well known, can be accelerated by centrifuging.

5. Lactose. This is a disaccharide sugar, as already explained in a previous chapter. Lactose does not readily undergo alcholic fermentation but is very readily attacked by various bacilli, becoming transformed into lactic acid—hence the spontaneous souring of milk.

6. Salts. Chlorides and phosphates of soda, lime, potash, and magnesia are present, but the preponderating salt is phosphate of lime as this is needed for the rapid bone growth of the young animal.

7. Lipoid. Lecithin and cholestrin are present but not in such quantities is cow's milk as in human.

8. Organic acids. These reckoned as citric acid are present in cow's milk to the extent of about 0.25 per cent.

9. Other substances. Without doubt there are many substances present in small quantities which further research will discover and estimate. There is evidence that milk contains antitoxins which are absorbed best in the colostral period; also enzymes, the use of which is unknown; the precursors of hormones, &c. The pigment has already been mentioned.

We may regard milk as a perfect food for the young of the same species as the milk-secreting animal. It is impossible to alter the milk of any animal to make it suit the requirements of the young of another species.

AVERAGE PERCENTAGE COMPOSITION OF THE MILK OF VARIOUS ANIMALS.

—	Cow.	Goat.	Sheep.	Mare.	Ass.	Sow.	Human.
Water	87·4	87·3	84	90	92·5	82·4	90.2
Caseinogen	2·9	3	5·3	1·9	1·7	6·1	1.5
Lactalbumen	0·5	0·5					
Fat	3·7	3·9	5·4	1·1	0·4	6·4	3·1
Lactose	4·8	4·4	4·1	6·7	5	4	5
Salts	0·7	0·8	0·7	0·3	0·4	1·1	0·2

VARIATION IN MILK.

The milk of all mammals varies somewhat with the period of lactation to suit the needs of the young. Variations in food supply affect chiefly the quantity but not the relative proportions of the ingredients. The milk fat can alter slightly in character when certain oily foods are administered. Thus linseed meal gives a butter with a low melting point and bran one with a high melting point. Stagnation of milk in the udder causes a fall in the fat content. The breed of the cow is a most important consideration, witness the high fat content of milk from Jersey cows and the much lower fat content of milk from Ayrshires. In milking the last drawn milk is much richer in fat than the first drawn. This is probably due to a number of factors, one of them being that the larger fat globules meet with more resistance in passing through the small ducts and so come out only towards the end of milking. When the food of a lactating mammal contains highly diffusible and strongly flavoured substances these are apt to appear in the milk after a short interval of time. If the food in question be not repeated the highly flavoured substances will be reabsorbed into the blood and removed from the system by the kidneys. Thus if a cow has a feed of cabbage or garlic and is milked a few hours afterwards the milk is strongly tainted with undesirable flavouring matter; but if the milking be carried out immediately after, or twelve hours after the feed, the milk may be free from the objectionable flavour.

HEREDITY.

It has been shown that in the fertilised ovum and therefore in every cell in the adult body the chromosomes are derived half from the mother and half from the father. If we regard the chromosomes as conveying the special characters of each parent we might expect to find that the offspring is a blend of its parents and ancestors. In fact Galton has framed a noted law of ancestral inheritance which states that the two parents contribute between them on the average one half of the total heritage of the offspring; the four grandparents one quarter; the eight great grandparents one eighth, and so on. It should be noted, however, that this law would only hold true if a large number of cases were taken and the average computed. Elaborate statistical investigation has shown that such qualities as size, duration of life, and fertility, follow Galton's law. But it must be admitted that certain qualities do not, and here we enter on controversial matter. In 1865 Gregor Johann Mendel read a paper on the results he had obtained with crossing peas. His work excited no interest until 1900, when the experiments were repeated and confirmed and *Mendel's law*, as it is called, gaining a footing in biological circles. In Mendel's law there are two distinguishing features. One is that certain characters may be *dominant* and others *recessive*. Thus a grey mouse mated with a white mouse will have grey offspring. Greyness here is dominant and whiteness recessive; but the offspring are true hybrids for they will have some white among *their* offspring. The second feature in Mendel's law is that it allows us to calculate the distribution of certain characters amongst the offspring. An example or two will make this point clear. A black fowl of a certain type mated with a splashed white of a certain type will give a hybrid which the fancier in his ignorance has termed pure-bred Andalusian. If we mate Andalusian with Andalusian the result is that the offspring arise in the following ratios—one black, two Andalusians, one splashed white. If the parental characters are represented by D (dominant) and R (recessive) then if D is mated with R the offspring will all be DR. If DR be mated with DR then the offspring will be DD, DR, RD, RR, which may be written DD, 2DR, RR; if the dominance be very marked the proportion will appear as three dominants to one recessive. Take as another example the susceptibility of wheat to "rust." The quality of immunity is recessive, that of predisposition is dominant. When an immune strain and a predisposed strain are crossed the resulting hybrids are all susceptible. But if these hybrids are allowed to self-fertilize then dominant susceptibles and recessive immune plants are produced in the calculated ratio of three to one. A more complex example is that in which a pea plant yielding green and round peas is crossed with one yielding yellow and wrinkled peas. Now round and yellow are both dominant, whilst wrinkled and green are both recessive. The hybrid therefore will be yellow and round. If such a hybrid pea plant be self-fertilized the progeny will be found to follow the proportions which can be calculated, namely 9 yielding yellow and round peas, 3 yielding yellow and wrinkled, 3 yielding green and round, and one yielding green and wrinkled.

It is a matter of the greatest importance that future research in this field should give such results that the breeder will know what characters follow Mendel's law and what do not. As an example of an exception may be mentioned the crossing of Border Leicester rams and Cheviot ewes giving a hybrid which breeds true to its type. Also the various characters may, in the future, be classified according to their degree of dominance or recessiveness. Thus, in the case of poultry, rose comb, white plumage, feathered shanks, and brown eggs are supposed to be dominant as against the recessive leaf comb, black plumage, bare shanks, and white eggs.

SOME DEBATABLE POINTS IN HEREDITY.

MATERNAL IMPRESSIONS.—That the offspring whilst still in the uterus can be influenced by faulty nutrition or disease of the mother is admitted by all; that it can be influenced by things witnessed or cogitated by the mother is an idea as old as Holy Writ. While firmly believed in by the majority of breeders it is regarded as due to unscientific observation by most if not all expert biologists.

TELEGONY.—This word is used for "the supposed influence of a previous sire on offspring subsequently borne by the same female to a different sire." This also is believed in by most breeders, but all experiments at biological laboratories and farms have failed to give a single instance of it.

INHERITANCE OF ACQUIRED CHARACTERS.—Acquired characters are those which result from the action of external agencies upon the organism in contrast to those that arise or reside in the sexual cells. Thus, in man, change of residence to a hotter climate will darken the skin; certain trades will give distinguishing characters of hand, skin, limb, and muscle; a skilful movement repeated many times will give facility in performing the movement through changes in the nervous system and the limbs. The question arises—can these be transmitted to the offspring? Some of the earlier upholders of the evolutionary theory believed strongly that such was the case. A giraffe, for instance, was supposed to have acquired a long neck through the perpetual stretching of it for many generations in order to reach the leaves of trees. Though the subject is still *sub judice* it may be stated that by far the majority of biologists declare that such transmission does not exist. There is not only evidence against this view such as the non-transmissibility of mutilations, but further it may be definitely stated that there is no instance so far of supposed transmission of acquired characters which cannot adequately be explained by assuming that variations took place in the reproductive cells and that natural selection was able to insure permanence to those animals that possessed an advantageous variation, and was able to weed out those that did not possess it. The reproductive cells, both of ovary and testis, are set apart in a very early stage of embryonic life and it is difficult to see how they could be affected by alterations in an animal's structure due to the animal's own activity or to the action of an altered environment. Of course malnutrition or disease may influence the sexual cells like any other cells of the body but this does not affect the argument.

VARIATION.—The Darwinian doctrine of evolution assumed that variations of almost imperceptible character were constantly occurring. If a variation were of any advantage it persisted through natural selection and so in course of time the variation became cumulative. There is however some evidence for the view that, at any rate in plants, variations may arise of unexpected magnitude and further that such variations do not arise at all times in the history of a species or race but are limited to restricted epochs. Thus all the specimens throughout the world of *chelidonium laciniatum*, a celandine, are descended from an ancestor that appeared in 1590 in the garden of an apothecary in Heidelberg. In 1887 Professor De Vries found two new specimens of evening primrose in a deserted potato field near Amsterdam. These bred on the whole true to type, but showed unmistakable evidence of a power to alter by leaps and bounds and not by the slow changes which Darwin considered the rule. To this form of variation Professor De Vries gave the name *mutation*. So far instances of mutation have not been clearly demonstrated in animals though "sports" are known and, of course, reversions to ancestral types.

NHILL FARM COMPETITION, 1908.

H. Ross, Field Officer.

REPORT TO THE SECRETARY, NHILL AGRICULTURAL SOCIETY.

I have much pleasure in forwarding my report and awards in connexion with the recent Farm Competition held under the auspices of your Society. It is most gratifying to have had such a large number of entries (31), and while the number of entries for the large competition was rather small, the entries for crops grown on Mallee and fallowed land exceeded those of the previous year. A healthy spirit of rivalry has been evoked by these competitions, and your Society is to be complimented upon the fact that it has for years past taken the lead in such matters. A revised scale of points from last year gives greater prominence to water conservation and permits of more detailed criticism in regard to stock. In reviewing the whole of the farms and crops inspected, I trust that my comments will be accepted in the light of friendly criticism.

BEST WORKED AND MANAGED FARM OF 640 ACRES AND OVER.

(A) *Best System of Cropping, including Cultivation Methods, Rotation, and Manures—25 points.*—The system usually adopted by Wimmera farmers, that is—wheat, then oats, followed by two or three years in grass and fallow again leaves very little to be desired. I have been shown some excellent results obtained by a system of wheat, then barley, followed by oats—in fact some of the best oat crops seen were those which had been sown on barley stubble. The question of manuring, kind of manure to use and quantity per acre has been settled, at all events for some years. The superiority of superphosphate over other manures is an established fact upon which Wimmera farmers appear to have agreed. The usual practice of early winter fallow is universal.

(B) *Cleanest and Best Crop, including Oats—20 points.*—The varieties of wheat favoured most by competitors were Federation, Dart's Imperial, Purple Straw; and the oat varieties—Algerian for seed, and Calcutta oats for hay. The majority of the crops were more or less dirty with wild oats, mustard, poppy, and wild daisy, take all and white-heads also having made their appearance in some of the fields. A remarkably clean crop, however, promising to yield about 20 bushels per acre, was exhibited by Mr. W. Sanders. Trueness to type and freedom from foreign heads still leaves a good deal to be desired and more attention should be given by farmers to the purity of seed wheat. A point which struck me as being worthy of notice is that white-heads had made their appearance far more in late worked fallow than in the earlier worked fallow. Very little smut was met with in wheat and this no doubt can be attributed to the almost universal practice of pickling. On the other hand smut was evident in some of the oat crops and it may be well for farmers to consider the advisability of pickling oats as well as wheat.

(C) *The Fallow in Best Order, Area to be Considered—20 points.*—The fallowed land on the whole reflects credit upon the competitors. In most cases it was well worked, the exception being the red land which of course will not stand the same amount of working as the black land. Mr. Crouch exhibited 460 acres of fallow in first-class order, well-worked without being too fine, and very clean.

(D) *The Best Quality and Serviceable Classes of Stock kept on the Farm; Horses—20 points, Sheep—20 points, and Cattle, Pigs, and Poultry—5 points.*—In awarding points for stock, attention has been given not only to quality but also to general utility for farm purposes.

Horses.—The quality of the horses inspected was throughout of excellent character. The practice of breeding compact, nuggetty horses able to cover ground actively appears to me to be an improvement in the right direction. A splendid lot of yearlings and 2-year olds, also good classes of buggy horses and hacks, were exhibited by the competitors.

Sheep.—The continued high prices ruling for export lambs and wool have been responsible for a good deal of attention being paid by farmers of recent years to this adjunct to the farm. The question which is the most suitable or payable class of sheep to breed is one which the farmer is best able to decide himself. Merinoes appear to be favoured most by competitors—Messrs. Sanders, Allen, and Crouch going in solely for this class, while Mr. Dickinson, besides merinoes, has a sprinkling of crossbreds. The whole of the sheep were in good condition, and those of Mr. W. Sanders, including ten fine rams, were of particularly good class.

Cows, Pigs, and Poultry.—Very little attention is given by any of the competitors in this section, the reason no doubt being of minor value. Cows and steers were of mixed quality, mostly shorthorn crossed, the exception being a few pure bred dairy cows belonging to Mr. Sanders.

(E) *The Most Complete Equipment and Class of Implements and Machinery—20 points.*—Machinery and implements play an important part on the farm and labour-saving appliances are always welcomed by farmers. A number of the competitors elect to use strippers while others again prefer harvesters, and something may be said in favour of both, for while the stripper has the additional advantage of saving the blow chaff, the harvester on the other hand can be worked with less labour and more economically. Ploughs, harrows, cultivators, discs, drills, scoops, farm waggons, &c., were in good evidence, and those competitors possessing oil or steam engines scored a few points higher than those who were content to use horse-works. In addition to a very complete set of all kinds of implements, Mr. W. Sanders has also installed a complete shearing plant.

(F) *The Best System of Boundary and Subdivisional Fencing, including Gates and Sheep-yards—15 points.*—Messrs. G. Crouch and R. Dickenson appear to me to have the best subdivisional system, that is to say they have divided their paddocks into suitable blocks that are easily accessible. Fences in all cases were of good serviceable quality. Messrs. Sanders and Crouch have erected no less than 26 and 10 new iron gates respectively since the previous competition. Good sheep yards and a very conveniently situated sheep dip were a pleasing feature on Mr. Sanders' property.

(G) *The Best Kept Orchard and Vegetable Garden—10 points.*—Only one of the competitors (Mr. W. Sanders) had made provision in this respect to any extent, and his fine orchard, containing fruit trees of almost all varieties, entitles him to first place. Mr. Crouch's orchard is on a smaller scale, and Messrs. Dickinson and Allen have their dwellings beautified by very nice flower gardens.

(H) *The Best Arranged System of Water Storage. Points to be given for Number of Dams and Windmills, Capacity, Location of Catchment, Accessibility to Stock and ease of Watering—45 points.*—The greatest number of points in any section has rightly been allotted to water conservation. The importance of having a large number of dams conveniently

situated together with windmills, troughs, &c., cannot be overestimated. It is highly pleasing to note that such a good storage of water has been provided for by all four competitors. Mr. Crouch has erected a new windmill supplying troughs in paddock, stables, &c. Mr. Sanders' water supply extends to orchard, piggery, sheep dip, stables, and paddocks, and his two fine dams are well worthy of mentioning. Mr. R. Dickinson has also a splendid supply of water for stock, each one of his paddocks being provided with dams ranging from 1,000 to 2,000 yards. In Mr. Allen's case I have had to consider that in some of his paddocks, so far, no water has been conserved.

(I) *The Best Arranged Dwelling and Outbuildings—20 points.*—Elegance and comfort for the dwelling and convenience for the outbuildings are evidently the factors which guide the farmers in your district. I was much impressed with the up-to-date conveniences in existence, not only in the dwelling, but also in stables and wool-sheds. Mr. G. Crouch's new well-ventilated galvanized iron stable, replete with the latest improvements, installation of acetylene gas, and water pipes for troughs, adjacent chaff-shed, &c., is indeed a model of construction and comfort. Mr. W. Sanders' splendid wool-shed, with shearing machine, has also much to commend it. Both these gentlemen make use of acetylene gas in their commodious homesteads. Dwellings and outbuildings of the other two competitors, Messrs. Allen and Dickinson, while perhaps lacking in some conveniences, are no less substantial and comfortable, the well-kept flower garden of Mr. Dickinson deserving a special word of praise.

(J) *Best Reserve of Fodder of Any Kind—15 points.*—With the exception of a little straw, no provision has been made by any of the competitors, the prospects of a good season and the high prices ruling for hay having induced them to part with their stocks.

(K) *Best Efforts in Direction of Tree Planting—5 points.*—Little comment need be made in this direction, but, if anything, I think that all four competitors err rather on the side of not having planted a sufficient number of such quick-growing and ornamental trees as sugar gums or pepper trees.

(L) *Farm and Stock Insurance—10 points.*—In three cases the rule prevailed of insuring dwellings and stock, the exception being Mr. Allen, who only insures his entire horse.

After having very carefully considered the different points from which a judge should look upon every detail, I have come to the following conclusion:—

Competitor.	A	B	C	D	E	F	G	H	I	J	K	L	Total.
W. Sanders ...	21	17	16	41	18	12	8	40	16	5	3	8	205
G. Crouch	21	15	18	38	17	13	6	39	18	5	3	8	201
R. Dickinson ...	21	16	17	36	17	12	4	38	14	5	3	8	191
F. G. Allen ...	21	15	16	37	16	11	4	37	15	5	2	6	185

THREE-FOURTHS OF A FARMER'S WHEAT CROP ON FALLOWED LAND.

Ten entries were received in connexion with the competition. The principal point for comment this year is that most of the crops are dirty with wild oats, and are affected more or less with whiteheads and take-all. The yield in most cases must be considered a highly satisfact

The points upon which the judging were based are:—

Cleanliness, 10 points; trueness to type, 10 points; freedom from disease, 10 points; apparent yield, 1 point for each bushel.

Competitor.	Cleanliness.	Trueness to Type.	Freedom from Disease.	Apparent Yield.	Total
Gneil and Gladigan ...	9	7	8	26	50
P. Bone, jun.	8	8	8	24	48
G. Batson	8	8	9	22	47
C. W. Huf	7	8	8	23	46
Ward and Walsh ..	7	8	7	22	44
Bond and DeMoulpied ...	7	8	8	20	43
T. Ervin	7	8	8	20	43
G. Crouch	7	8	8	18	41
F. G. Allen	8	7	8	18	41
W. Dahlenburg			Withdrawn.		

BEST 100 ACRES GROWING CROP ON MALLEE LAND.

It is again satisfactory to note that ten entries were received in thi section. There is one feature I would like to draw attention to, and tha is the imperative necessity for fallowing. Two competitors (Messrs. W Krelle and W. Baldwinson) each exhibited a 100-acre crop of wheat The two crops were sown at the same time on exactly similar land, an are, as a matter of fact, only one chain apart. Mr. Krelle's land ha been fallowed, but Mr. Baldwinson's had not. The results are, in th former case an apparent yield of 15 bushels and in the latter case 8 bushels

Competitor.	Cleanliness.	Trueness to Type.	Freedom from Disease.	Apparent Yield.	Total.
D. R. McKenzie	7	8	7	23	45
E. F. Schultz	7	8	7	21	43
F. W. Bothe	7	9	9	17	42
L. Kemp	6	8	7	20	41
C. A. Janetzki	5	5	8	22	40
J. Blake	9	8	8	14	39
W. Krelle	8	8	8	15	39
J. Dart	6	8	8	15	37
W. Baldwinson	7	8	8	8	31
Haines Bros.			Withdrawn.		

It is, perhaps, only right to mention that the winning crops were grow on Mallee fringe and not on sandy soil. I would suggest that if a dis tinction were made between crops grown on Mallee and on Mallee fring it would not bring those competitors on sandy Mallee land into com petition with those whose land, though held under a Mallee lease, differ in quality from what is known as true Mallee land.

BEST FALLOWED LAND NOT LESS THAN 80 ACRES.

Only seven farmers competed. The reason for such a small entry is hard to find. Twenty possible points was the scale fixed, and the following are the results :—

	Points.
E. J. Hoffmann	19
Mrs. Dickenson	18
G. Batson	18
G. Crouch	18
W. Sanders	17
F. G. Allen	17
Walsh and Ward	16

EXPERIMENTAL WORK.

Messrs. Geo. Batson and H. Dahlenburg were the only competitors in this section. The work carried out by those two gentlemen affords some very useful and interesting information. Manurial tests, wheat variety tests, experiments with grasses, lucerne and rape, and rotation of crops, different methods of pickling, have been successfully carried on; but the two experiments, or, perhaps I should say demonstrations, which struck me as being of the most practical value are:—1st, a rotation of crops carried on by Mr. Batson; and 2nd, a successful attempt by Mr. Dahlenburg to make mellow and friable those hard red clay patches with which the northern farmer unfortunately is only too familiar. Mr. Batson, instead of sowing oats after a crop of wheat, put in a crop of barley, with the result that last year he obtained a yield of 28 bushels of English barley per acre. A crop of oats was sown on the barley stubble, and promises to yield better than any other oats he has in. This year a similar practice was followed with Cape barley, yielding 40 bushels per acre. The methods of Mr. H. Dahlenburg to mellow those red hard patches to which I have previously alluded is to plough in a liberal application of stable manure. The result from this treatment is that the ground does not run together, and as a matter of fact becomes in all respects equal to the surrounding black land. Extensive experiments have also been conducted in cultivation methods. Harrowing the crop after it was up about 3 to 4 inches with light poppy harrows has effectively got rid of the poppies, and also increased considerably the yield of the harrowed portion. Mr. Dahlenburg has conducted this experiment in several paddocks, always taking care to leave a certain portion of the field unharrowed so that the difference can be noted. The different wheat variety tests carried out by this gentleman are rather on a large scale, and should prove a great value to your district. In making my awards I have placed—

H. Dahlenburg	1
G. Batson	2

In conclusion, I beg to offer my thanks to those gentlemen who have so hospitably entertained me, and to you for the excellent arrangements made during my stay.

SEPTICÆMIA HÆMORRHAGICA IN CATTLE.

("BUFFALO DISEASE.")

A. W. Curlewis, Stock Inspector.

During the last few months considerable mortality in cattle has occurred in parts of the State through a disease which has hitherto remained unidentified in Australia or but little known; but which the Chief Veterinary Officer (Mr. S. S. Cameron, M.R.C.V.S.) has classed as a form of Septicæmia Hæmorrhagica, known in some countries as "Buffalo Disease" and in others as "Deer and Cattle Disease." As I have seen a good deal of the disease recently I have thought that particulars of my observations, &c., might prove interesting.

In Friedberger and Frohner's work on Pathology, Vol. I., reference is made to an outbreak that occurred in 1878 among deer in several of the Royal Parks in the neighbourhood of Munich, and it is stated that:—"It was originally mistaken for anthrax, but is readily distinguished therefrom by absence of the bacillus of anthrax; absence of enlargement of the spleen and of the characteristic tarry condition of the blood." Various forms of the disease are described. Apparently however the most prevalent, at least in this State, is the intestinal form and it is with this form principally that I must therefore deal. The subject may perhaps be best put by giving, briefly, particulars of individual cases which have come under my notice.

CASE A.—Cattle in fair condition running in good hill country, laid down in English grasses and watered by running streams.

Mortality:—Ten head within a period of two weeks found dead by owner. No symptoms of sickness observed. In most cases a little blood had oozed from nose and anus after death. On paying visit of inspection to this farm one cow was discovered down and at the point of death; her throat was cut and she bled but not freely; the blood was thin and light in colour.

Post-mortem examination showed extensive hæmorrhages or extravasation of blood on the peritoneum, walls of chest, spleen, covering of heart and lungs, and small patches on outside surface of body, near stifle joints, presenting a strawberry or streaky appearance. There was an exudate of serum in the abdominal and chest cavities and patches of adhesive inflammation on peritoneum. The liver was somewhat enlarged and the contents of gall bladder were thick and dark. The spleen was normal in size and firm in consistence.

CASE B.—Cattle kept under similar conditions as to country, grass, &c., and in forward store condition.

Mortality:—Six head within three or four weeks. Symptoms observed:—Partial loss of appetite, hollow flanks, slight stagger of hind quarters; and toward the last stage frequent passings of small quantities of excreta encased in thick layers of coagulated blood and mucus; death usually occurred in from two to four days.

The first cow examined had been sick for four days; the temperature was extremely high and she appeared to be in great pain. She was bled to death but the blood was very pale and scanty. *Post-mortem* appearances:—Acute inflammation of colon or lower bowel; slight inflammation of fourth stomach; liver somewhat large, other organs normal. The second cow examined was seen in apparently good health one night and was dead in the morning. She had passed quantities of blood-stained excreta

as previously described. *Post-mortem* examination revealed much the same condition as in the first case with the addition of hæmorrhagic spots on the spleen.

CASE C.—Loss of six cows out of twelve under similar conditions as above, within a period of three or four weeks.

I did not have an opportunity of making a personal examination in this case, but a neighbour of the owner made a *post-mortem* examination of the last cow to die, and supplied me with a detailed description of appearances which tallied in almost every respect with those noted in Case B with the addition of some of the appearances observed in Case A.

CASE D.—Mortality:—About fifteen cattle in fair condition under similar circumstances to those mentioned in Case A. No symptoms observed. The cattle died suddenly. *Post-mortem* examination of one cow did not show such marked indications of disease as in the former cases, and in that respect it bore out the statement in Friedberger and Frohner that in some acute cases very slight changes are found. *Post-mortem* examination made subsequently of a yearling heifer, however, showed acute peritonitis, adhesion of coils of the intestines, and extravasation of blood in the peritoneum covering the intestines.

CASE E.—Loss of nine or ten head of three-year old steers in fair condition. Mostly found dead, but one animal lost appetite and showed general ill-health two or three days before death. This animal also passed small quantities of coagulated blood, &c., as previously described. *Post-mortem* made on this steer showed inflammation of fourth stomach and intestines, particularly of the colon, with hæmorrhagic patches and streakings on peritoneum, surface of heart, spleen, &c. Thus the features observed in cases A and B were combined in this case.

CASE F.—Mortality:—Five or six cows recently calved, good condition. Some found dead, others observed to stagger a little, "get down" and die in a few hours. In most cases they continued milking up to the last. *Post-mortem* examination of one cow showed slight inflammation of stomach and intestines and hæmorrhagic streakings on surface of heart; not a very distinctive case. This cow was in good condition with milk still in udder; no blood appeared to have oozed from nose or anus.

CASE G.—Two neighbours had lost about twelve cows each within a few weeks, fair feed. One owner stated that in some cases the head and throat became much swollen, that the cows had died in from two to four days, and that swelling was caused by a jelly-like substance. These cases correspond exactly with the exanthemic form described by Friedberger and Frohner. One cow seen by me showed dulness and general debility. In a *post-mortem* examination of a cow on the next farm, however, in addition to appearances previously noted, there were œdematous swellings along the course of the intestines and also to a limited extent about the throat.

There has in some cases been a strong opinion formed that the mortality was due to poison, and in others to impaction, or else to irritation of walls of intestines through the stock eating ferns or other rough herbage, but careful examination has proved the latter reason untenable in any of the cases brought under notice. The localities where mortality occurred were frequently remote from one another.

TREATMENT AND PREVENTION.

Treatment cannot often be carried out and is usually of little avail, but where opportunity occurs the Chief Veterinary Officer [illegible]

2-oz. doses of laudanum may be tried, supplemented by 1-oz. doses of a 5 per cent. solution of cyllin, or other non-irritating disinfectant.

As a suggested preventive, two or three drenches of cyllin solution (two to four drams of cyllin to one or two quarts of water) may be given to all cattle which have been exposed to infection and may have the effect of checking an outbreak.

Inoculation has been tried in Italy with satisfactory results, but the virus needs to be attenuated. Carcases of all animals which die should be burned thoroughly and the disinfection measures which are usually imposed in respect of contagious diseases carried out as far as possible.

EXPORT OF BEST EWE LAMBS.

H. W. Ham, Sheep Expert.

By best ewe lambs it is not to be understood that they are the best from an exporter's point of view, but the best from that of the lamb-raiser and the wool-grower, for many lambs suitable to the exporter would be almost useless to the grazier for future profitable work.

During the rush of the past season we have witnessed a condition of things that all good sheep men regret to see, that is, the good sorts of bulky-fleeced ewe lambs of the white-faced breeds principally that have been sent to the freezing works. Many of them towards the end of the season were far from being even good quality lamb when dressed, to say nothing of being prime. This want of condition is caused in most cases by being kept too long into the dry weather, and in other instances by negligent feeding.

There is no regret to be expressed over the fine-woolled sorts, for plenty of useful merino ewes will always be available at very reasonable prices for general purpose lamb-raising and cross-breeding. Badly-bred fine-wool lambs are better out of the country at any price.

It is the first and second cross ewes—in other and more correct words, half-breds and three-quarter-breds—that produce our quality lambs, and in the quickest time too, no matter to what breed of ram they may be joined, so long as the ram is shapely and thick fleshed. Generally speaking there can be nothing gained in the end by selling these bulky-fleeced thick-set ewe lambs at under 10s. If grazing room can be found for them they will pay better to hold.

This class will always compare favorably with others in wool return per head. Held as a store sheep for another year this lamb in ordinary seasons will increase in value to the extent of 5s. to 7s. Adding this and the two fleece values together (for the lambs if held would be shorn), there is then as much profit as in raising another lamb. Apart though from this, farmers know how difficult it is to buy good sorts of ewes, even when willing to pay extreme prices for them. A breeder as a rule cannot buy as good as he can breed on his own ground. A proportion of these best-woolled roomy ewe lambs should be kept by all who have grazing room for them. It is the good roomy ewes, when allowed plenty of the right class of grass or fodder, that rear the special quality lambs.

The prices that are taken each season when the rush from our northern areas occurs should impress upon many farmers the advisability of breeding only the very best crosses and classes, for then their ewe lambs will always pay to keep for future use, if found necessary.

ARSENICAL POISONING IN CATTLE.

W. J. Colebatch, B. Sc. (Agr.), M.R.C.V.S., Assistant Chief Veterinary Officer.

Outbreaks of arsenical poisoning amongst live stock are fortunately so rare as to immediately attract the attention and interest of all farmers, stockmen, and veterinarians. It is true that sheep are sometimes poisoned through being dipped in arsenical solutions when over-travelled and thirsty; or again, they may suffer as the result of prolonged dipping, or from eating herbage on which the drippings have fallen. Cattle however, are not as a rule exposed to such dangers, and, except when located in the vicinity of noxious chemical and smelting works or when made the victims of accident or malice, they rarely suffer from arsenical poisoning in any form. In those countries however where cattle require to be dipped, smeared, or sprayed with arsenical mixtures, or where the practice obtains of spraying trees or pastures with toxic preparations for the eradication of animal or vegetable pests, serious losses not infrequently occur.

In this connexion, it may be interesting to refer to an article on "Poisoning of Stock with Arsenic" which appeared in the November issue of the *Veterinary Journal.* The author, Mr. L. E. W. Bevan, M.R.C.V.S., Government Veterinary Surgeon, Rhodesia, there records his observations in regard to a number of cases of arsenical poisoning amongst stock grazing on sprayed pastures. It appears that, in Rhodesia, the ravages of the locust are so serious that the practice of spraying the grass paddocks with a solution of arsenite of soda and brown sugar has been instituted. Whilst this may be efficacious in regard to the young locusts, it is often followed by disastrous results amongst the cattle, as the latter naturally cling to the sprayed areas on account of the sweet flavour of the herbage. Arsenical poisoning arising from this practice, is peculiarly interesting at the present juncture, inasmuch as two serious outbreaks have occurred in this State during the past month. As regards one of these, the particulars cannot at present be recorded as the matter may possibly be the subject of review in the law courts. In the other case, which occurred at Camberwell, the source of the arsenic was not discovered, but it is known that the cattle were in the habit of road grazing.

HISTORY OF CAMBERWELL OUTBREAK.—There were 23 Jersey grade cows, seven or eight calves, and a bull in the herd; and of these, nine cows and a calf died. The farm, which has been considerably over-stocked, comprises 18 or 19 acres of bare land, no attempt having been made to grow forage of any kind, and consequently the cattle are fed wholly on dry fodder, viz.:—oaten hay, bran, and pollard. All the stock on the farm have access to the same water trough which is divided into two parts. The dairyman is cleanly in his methods, feeds liberally, and the stock are all in good order. There have been no suspicious deaths on the farm hitherto, only two head having been lost during the last two years. One heifer died from eating sand this year, and another, about two years ago, fell into a creek that runs through the property and broke her neck.

The cows were apparently all right on the evening of 10th December at milking time. During the night they got out on to the road and wandered away to graze but returned to be milked next morning apparently none the worse.

About half-past four that afternoon the owner observed that four cows appeared dull, refused to eat, and gave very little milk. He noticed further that two others were standing by themselves in the paddock, stag-

gered on being moved, refused feed, and went right off their milk. The dairyman however did not view the matter seriously as he ascribed the symptoms to over-feeding. It is a common practice for dairymen to give their cattle extra feed on Friday morning to insure a plentiful supply of milk for Saturday's delivery. In the early hours of Saturday morning, 11th December, two died, and professional aid was then obtained. A *post-mortem* examination revealed signs of irritant poisoning, especially in the abomasum or true stomach, which was acutely inflamed. Four other cows exhibited symptoms of sub-acute colic—moaning and grunting at intervals—and were drenched with iron, chalk, and emollients. Medicinal treatment however, proved of little avail as two more died between eight and nine o'clock on Saturday morning, and a like number succumbed through the night.

On Sunday afternoon (13th December) the second autopsy was made, and the following morning another beast, whose udder had been inflated during the previous afternoon, and which had subsequently regained control of its hind quarters, died and was subjected to a *post-mortem* examination. Another death took place on Monday, and the ninth beast being "in extremis" was slaughtered and examined on the following morning.

Chemical Examination.—Samples of the gastric and intestinal contents of two cows were examined chemically and the presence of arsenic detected. Qualitative analyses of the fodder (bran, pollard, hay) gave negative results, but in the case of the water samples there were "slight indications of the presence of internal poison identical with arsenic." The results obtained by chemical analysis were supported by the appearance of the *post-mortem* lesions and to some extent by the clinical symptoms.

Symptoms.—In his article on "Arsenical Poisoning," Bevan points out that "where the drug has been swallowed the symptoms seem to depend upon the quantity and the form in which it was taken. Thus a very strong solution of a readily absorbed form of arsenic produces most acute symptoms, but solid and compact pieces of arsenic, not easily dissolved, or preparations of the drug not readily absorbed, give rise to less acute symptoms and a slower form of poisoning." Possibly, as he suggests, such solid lumps or particles may remain unchanged in the rumen, causing practically no systemic disturbance till washed on into the more sensitive abomasum and intestines by incoming liquids. In the true stomach and intestinal tube, absorption is rapid and the delicate mucous membranes suffer severely from the caustic properties of the drug.

At Camberwell, only sub-acute cases were encountered. Six died between the 24th and 48th hours and the other three after a longer interval. The chief symptoms exhibited were as follows:—

1. Dullness, weakness, loss of appetite, reduced milk flow, and in some cases groaning and grunting as if in pain.

2. Diarrhœa—the discharge being slightly sanious. In one instance the rumen was impacted and doughy but no violent colicy symptoms or tenderness over the belly was observed.

3. Temperature subnormal and ears cold. The thermometer readings ranged from 99.2 deg. F. to 101.0 deg. F.

4. Pulse 90—120; small and weak; almost imperceptible in some cases.

5. Respirations normal; muzzle dry; conjunctivæ slightly injected.

6. Paralysis of hind quarters; staggering gait, and difficulty in rising.

Autopsies.—Four *post-mortem* examinations were held—three on beasts that had died twelve to twenty-four hours previously and one on a

slaughtered beast immediately after death. No marked stiffening of the hides was noticed, but putrefactive changes were considerably less advanced than usual in spite of the fact that hot weather prevailed during the outbreak.

The only really constant lesion discovered was acute inflammation of the abomasum and duodenum. In the slaughtered beast the mucosæ were found to be excoriated in patches, varying in size from a pin point to a large pea. These were distributed all over the abomasum, and the intervening areas of inflammation were, in parts, covered with blood clots.

In three out of the four autopsies the leaves of the first, second, and third stomachs peeled off readily and revealed hyperæmic mucous and submucous layers beneath, and in one instance, a straw coloured exudate about 1 inch thick and 3 inches in diameter was discovered in the peritoneal folds between the rumen and the abomasum.

With regard to the other organs, no constant pathological changes were observed. Petechial spots on the endocardium and on the mucous lining of the gall bladder were noticed in one instance, and an excessive amount of fluid escaped from the abdomen at the second autopsy, but the outbreak was too sudden to permit of the development of those morbid phenomena—fatty degeneration, emaciation, mummification, ulceration—that characterise more chronic cases of arsenical poisoning.

THE PROCLAIMED PLANTS OF VICTORIA.

(Continued from page 32.)

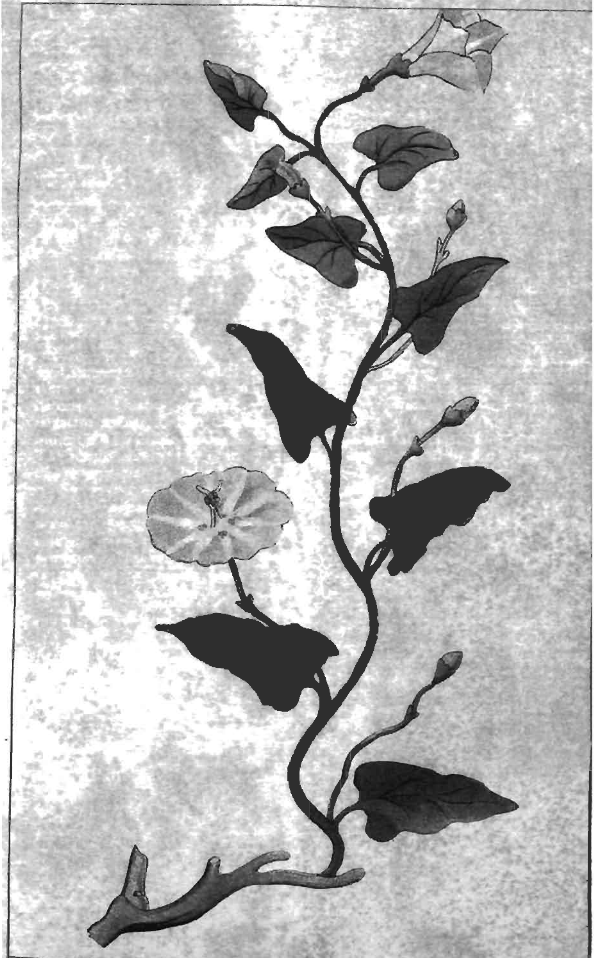
Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Bindweed.

Convolvulus arvensis, L. (*Convolvulaceæ.*)

A perennial with annual twining stems, arrow-shaped leaves, and rather pretty, pinkish flowers. The plant is one of the later introductions, and is very troublesome in cultivated ground. Its twining stems choke the plants to which it attaches itself, and its creeping underground stems render it difficult to eradicate, since quite small pieces will start fresh growths, and the stems are often a foot below the surface. The weed is especially troublesome in light friable soil, and in corn crops. Badly infected land should be deeply ploughed, and the underground stems harrowed or raked out. Where patches are present they should be forked out. The free use of the hoe in spring, and the growth of a leafy fodder or a root crop well encouraged by manure will help to keep down the plant and prevent its flowering. The seeds have a very prolonged vitality in the soil, and hence the prevention of flowering and seeding is very important. The plant is less mechanically dangerous on pasture, but the leaves are bitter, the underground stems purgative, and the seeds (four in each rounded capsule) are poisonous to stock if eaten in any quantity. Rotation farming coupled with occasional bare fallowing aids in keeping down a weed of this kind. Great care should be taken to avoid introducing it with impure seed, as has commonly occurred during the past. Its dark, somewhat triangular and roughened seeds are easily recognised. When ground in flour they spoil its colour, and render it injurious if present in any quantity.

PLATE 33.



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AGRICULTURAL EDUCATION.

REPORT ON CLASSES HELD DURING 1908.

H. V. Hawkins, Superintending Officer.

The short courses of instruction to farmers and others held throughout the State during the past year have again met with undeniable success. The one great difficulty experienced was how to provide sufficient instructors to meet the demand for lecture and demonstration work—and this is a problem that must sooner or later be solved.

LECTURERS AND STUDENTS, MINYIP.

Applications were received from no less than forty-two societies. Classes had previously been held in several of the centres. Thus there was the difficulty of selecting centres that had not hitherto participated in the ten days' course. Classes were established at the following places:—Alexandra, Ararat, Ballarat, Benalla, Bendigo, Bunyip, Camperdown, Cobram, Dandenong, Echuca, Elmore, Euroa, Geelong, Hamilton, Mildura, Minyip, Myrtleford, Redesdale, Rupanyup, Stratford, Tallangatta, Trafalgar, Warrnambool, Woodend, Whittlesea, Wycheproof, and Yea.

In most districts it was found desirable to hold the classes in the evening, and it is pleasing to note that a more regular attendance resulted therefrom. Dr. Cherry has decided that for the present year the whole of the lecture work when practicable shall be given in the evening, thus affording the lecture staff better opportunity to visit neighbouring farms, to advise, and give practical demonstrations each day. It is hoped that the secretaries of the local Agricultural and Pastoral Associations will bear this in mind and make arrangements with the organizer for the successful carrying out of the scheme. Much depends on the energy and enthusiasm of the local secretary in keeping the farmers well advised by means of advertising in the local press, and by circularizing the district.

The number of students who attended was 1,128, and the actual attendances, inclusive of visitors, were 16,667, representing an increase on

former years. Whilst the number of students is comparatively small, it must not be overlooked that the majority of those classed as visitors attended at least six days out of the ten days' course. Owing to the lectures being held at night, it was found difficult to call the roll, and in some instances, notably Mildura, time would not permit of it owing, in a measure, to the very large attendances and the lateness of the hour when lecture work ceased. It is questionable whether it would be wise to continue the system of calling the roll, and of holding examinations, as many of those who attend live 20 miles away.

The outstanding feature of the work carried out was undoubtedly the actual demonstration of the instruction given. This was noticeable particularly in the case of searing and lamb-marking, "putting up" of the farmer's wool clip, treatment of ophthalmia in sheep, and pruning, grafting, and budding in the orchard. Other instances of the importance of practical work to those attending can be cited, such as the selection of dairying herds and types, milk and cream testing, shoeing for unsoundness, &c.

The following table gives an analysis of the attendances and the percentage of marks gained by those centres where short examinations were held :—

Centre.	No of Students enrolled.	Average Daily Attendance.	Attendance (includes Visitors).	No. of Papers Examined.	Percentage of Marks gained by Centre.
Alexandra	61	57	659	25	29.71
Ararat	40	17	173	Nil	..
Ballarat	125	72	1,021	45	46.03
Benalla	72	18	279	17	60.92
Bendigo	57	31	490	41	60.24
Bunyip	71	56	560	33	33.66
Camperdown	76	22	565	12	70.06
Cobram	118	61	1,066	36	33.59
Dandenong	41	54	540	23	44.94
Echuca	88	21	268	12	36.63
Elmore	66	54	542	24	36.66
Euroa	61	16	283	36	52.75
Geelong	80	21	210	26	54.47
Hamilton	69	27	350	32	40.81
Mildura	40	40	1,310	Nil	..
Minyip	122	50	885	26	23.52
Myrtleford	121	57	1,037	48	32.43
Redesdale	64	35	556	27	53.30
Rupanyup	60	55	740	20	31.98
Stratford	63	36	567	36	35.15
Tallangatta	86	35	540	51	58.34
Trafalgar	90	30	709	42	57.91
Warrnambool	61	42	781	41	56.05
Woodend	62	32	644	39	30.23
Whittlesea	80	39	720	46	38.61
Wycheproof	59	43	542	45	28.18
Yea	92	46	877	22	47.31

The subjects and lecturers were as follow :—

Cultivation	W. J. Colebatch, B.Sc., M.R.C.V.S. F. E. Lee T. A. J. Smith
Dairying	R. T. Archer
Farriery	W. Kenneally

Orchard Work	.. ..	P. J. Carmody
Potato Culture	.. ..	G. Seymour
Poultry Breeding	.. ..	H. V. Ha[illegible]kins
Sheep Breeding	.. ..	H. W. Ham
Veterinary Work	..	W. A. N. Robertson, G.M.V.C. C. D. Strong, G.M.V.C.
Viticulture ..	.. ..	F. de Castella
Wool Classing	.. ..	H. Haile

Examinations in four subjects were conducted at twenty-five centres, half-an-hour being allowed for each subject. Regarded merely as a test of how the instruction had been received the results are satisfactory, and are an indication that the students possess a good general knowledge of the subjects dealt with.

The names of the students placed first and second in each centre, and the marks obtained by them are appended :—

Centre.	Student placed First in Order of Merit.	Marks.	Student placed Second in Order of Merit.	Marks.
Alexandra	O'Rorke, J. W.	322	Hill, Henry	270
Ballarat	Treloar, H.	331	Greenwood, L.	364
Benalla	Brown, A. H.	302	Moodie, A. R.	297
Bendigo	Pullen, W.	364	McRobert, W. G.	320
Bunyip	Hill, E. S.	315	Bruce, A.	291
Camperdown	Kerr, R. R.	358	Nicholls, W. J.	327
Cobram	Cochrane, R.	350	Hales, N. E.	252
Dandenong	Foote, H. V.	327	Pedlar, C.	288
Echuca	Malone, J.	179	Butt, A. D.	177
Elmore	Fudge, H.	306	Anderson, R. M.	276
Euroa	Lawrence, P. V.	353	Lawrence, L. H.	352
Geelong	Hennessy, J.	259	Peel, J. C.	251
Hamilton	Learmonth, J. A.	357	Quarterman, W.	274
Minyip	Jones, E.	148	McCubbery, P. J.	120
Myrtleford	Gegg, C. W.	323	Vale, S.	264
Redesdale	Hislop, G.	325	Hislop, A.	307
Rupanyup	Milligan, R. J.	181	Rutten, F.	173
Stratford	Mitchell, T. J.	336	Morison, A.	322
Tallangatta	Walsh, A. N.	379	Pearce, T.	374
Trafalgar	Rankin, E.	350	Gunn, W.	323
Warrnambool	McMahon, W. H.	382	Milne, A.	381
Whittlesea	Ross, W. L.	345	Dawson, R. E.	285
Woodend	Chambers, B.	330	Lee, F. W.	306
Wycheproof	Soncum, F.	288	Taylor, J.	233
Yea	Gill, J.	365	Coonan, M. P.	351

MEDAL WINNER.

The gold medal offered by the Australian Natives Association to the student gaining the highest marks in the examination was won by Mr. W. H. McMahon, of Warrnambool, who secured 382 marks out of a possible 400.

It is pleasing to record that in most of the centres visited the secretaries of the various societies willingly aided me in the organizing work. Thanks are especially due to these gentlemen, and also to the metropolitan and country press for their support and assistance rendered throughout the period.

* * * * * * * *

FARMERS' CLASSES FOR 1909.

The classes to be held during the current year will be conducted on similar lines to those of 1908, modified as under :—

Practical demonstrations will be given in all subjects morning and afternoon during the currency of the classes. Hitherto the demonstrations have been chiefly in connexion with veterinary work and other branches of live

stock. This year the same method will be extended to agriculture, dairy farming and all other subjects. The lectures will be delivered exclusively in the evening, and in nearly every case these will be illustrated by lantern slides.

District Secretaries are reminded that applications must be accompanied with the names of at least 30 students who have promised to attend regularly the whole of the ten days' course. The Department provides the staff and pays all expenses connected with the course, with the exception of the rent of the hall and advertising. This expense must be borne by the Society under whose auspices the classes are held. The organizer will visit each centre as soon as practicable after an application has been made, and will select suitable farms for each demonstration. The local Secretary must make all arrangements for the conveyance of students to and from the farms should this be necessary.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

POISONINGS.

(Continued from page 53.)

PLANT POISONS.

Homeria Poisoning.

Cape Tulip. (*Homeria lineata or Homeria collina*).

Description of Plant.—A bulbous plant from 2 to 3 feet high when fully grown, long parallel-veined leaves springing at intervals from the stem which is sometimes branched. The bulb is spherical and from ¾ in. to 1½ in. in diameter. It has a dark brown fibrous covering arranged in layers, between which are held numerous small bulblets—as many as 500 to each bulb. Clusters of these bulblets are also found adherent to the stalk at the nodes from which the leaves spring when the plant is mature. The plant may be propagated from each of these bulblets, so that the extreme rapidity of its spread in certain seasons, and the difficulty of eradication may be easily understood. The flowers are from 1 to 1½ inches across and are held on a flower stalk up to 2 inches long and protected in the bud stage by two bract leaves. They have a six-lobed perianth of a brick red or orange colour, yellowish towards the base. The flowers, a number of which are grouped together in the inflorescence, are delicate and fade quickly when plucked. The plant has been declared a noxious weed under the law of some of the Australian States.

Habitat of Plant.—Introduced into Australia from South Africa, most probably as a desirable acquisition to gardens, from which on account of its prolific capacity for propagation it has been allowed to escape into neighbouring pasture lands. In this connexion, it is to be noted that in the most authentic records of cattle poisoning by this weed the locale of fatalities has been open ground in the vicinity of houses in suburban and urban neighbourhoods—witness the fatalities at Pascoe Vale (Victoria) in 1892, at Mitcham (S.A.) in 1903 and Penrith (N.S.W.) in 1904.

Homeria is one of those plants to which, it would appear, stock acquire a considerable degree of tolerance when they become accustomed to it.

Dairy cattle and young stock habitually grazed on land where Homeria grows seldom show any ill effects from eating it; but when a travelling mob of strange cattle comes along the eating of it is frequently followed by a number of deaths.

The only practical method of ERADICATION which has given promise of success is continued ploughing and cultivation. Where this has been done year by year on badly infested lands few plants will remain, but if any remain it is only a matter of time when the paddock will be again overrun, so that it would seem safer that infested land should be given over wholly to cultivation for a number of years.

SYMPTOMS.—The symptoms successively noticed usually are:—restlessness, cerebral excitement, bowel and bladder disturbance indicated by frequent passage of urine and fæces, disinclination to move followed by inability and partial loss of power in the hind extremities. Motor paralysis of the limbs succeeds, and the animal cannot rise. The respiration and temperature are below normal; the pulse is accelerated, and there is difficulty in swallowing. The paralysis becomes complete, unconsciousness supervenes in fatal cases and death occurs in from one to four days.

On *post-mortem* examination the appearances are indecisive. The mucous lining of the fourth stomach (abomasum) and the first portion of the small intestine is usually congested. Identifiable portions of the stalk and leaves of the plant may be found in the paunch.

Experiments conducted by the Victorian Department of Agriculture in 1892 would seem to show that the mortality depends upon the quantity of plant eaten and that death only results when a considerable quantity is eaten at a time. When small quantities are partaken of the symptoms are less severe and pass off gradually. The animal after one or two feeds appears to acquire a dislike to the food and refuses to touch it. In this connexion it has been frequently noted that animals indigenous to a Cape Tulip locality never suffer any ill effects. Whether this is due to the gradual acquirement of a tolerance to the poisonous action of the plant or whether such cattle instinctively avoid it has not been determined, but it appears to be a general experience that only cattle strange to the district become affected. In two authenticated outbreaks amongst cattle the mortality was respectively 9 out of 18 and 20 out of 95. An extract of the leaves injected subcutaneously caused death in 8 pigs in 3 hours preceded by symptoms similar to those showed in cows. In South Africa natives (Hottentots) as well as cattle are said to have been poisoned by eating this plant. During the great Boer war 1900-2 the British cavalry horses were on two occasions reported to have suffered severely from Homeria poisoning at Carolina, South Africa. The prominent symptoms presented were those of flatulent colic with a dry, sour, musty smell about the mouth. The hypodermic injection of half grain doses of physostigmine was successful in effecting recovery in many cases. Calcium chloride in half ounce doses was also found beneficial.

Zamia Poisoning.

The cause of the disease of cattle previously known as "Rickets" in Queensland and Western Australia, although by no means a settled question, is now generally considered to be the eating of the leaves of the Macrozamia "palm" (*Zamia Frazerii* or *Zamia Dyerii*) from the bulbous underground stem of which the arrowroot of commerce is got. It is now more correctly described as Zamia paralysis. The symptoms appear to

closely resemble those exhibited by cattle affected with coast disease or "cripples" in Victoria (see October, 1906, *Journal*). A series of experiments were very ably conducted by Mr. H. H. Edwards, then Government Veterinary Surgeon of Western Australia in 1894 with the view of ascertaining the nature of the disease in cattle locally known as "wobbles," and by many regarded as a form of rickets. The result of his inquiries proved conclusively that zamia poisoning and rickets were different diseases. The latter exists in the southern part of the colony, but its characteristics are, he says, entirely dissimilar to those of wobbles. Mr. Edwards fed some healthy cattle on chaffed zamia leaves and other food, and they soon showed all the symptoms of wobbles in a pronounced degree. The intensity of the disease so produced was in direct ratio to the amount of macrozamia given and to the length of time the feeding of it was persisted in. The disease causes very little systemic disturbance, and when the zamia ingesta has left the system and the partial paralysis is not too severe the animal will fatten as well as ever. The meat of animals suffering from zamia poisoning is quite wholesome, and the milk shows no appreciable difference from that of sound cattle. The poison seems to attack the terminal branches of the arteries, particularly those which run through the foramina of the vertebræ. In old-standing cases several of the arteries become dried up, but still retain a red colour. These dried vessels have a worm-like appearance, and have been mistaken for dried up parasites by some who have suggested that they are the cause of the disease. Mr. Edwards found that an injection prepared in the following manner proved quite effective:—1½ gr. of eserine dissolved in 2 dr. rectified spirit, and 1½ gr. of nitrate of pilocarpine dissolved in 2 dr. of water. The two solutions having been mixed are injected in a downward cut made through the skin of the side a little behind and above the elbow.

Later Dr. Lauterer in Queensland was successful in separating from the leaves of macrozamia, when in the fruiting stage, a poisonous resin which produced fatal gastro-enteritis in guinea pigs and cats when administered internally, and local irritation and suppuration when injected subcutaneously. Lauterer looks upon the disease as a Spinal Meningitis and failed to produce its symptoms by feeding with macrozamia. *Post-mortem* examination of his experimental animals revealed pronounced appearances of gastro-enteritis (inflammation of stomach and bowels) but as all the animals died within a few days it may be suggested the deaths were due to a pronounced or acute effect of the poison and that if the animals had been given smaller doses, such as they would get naturally when nibbling the plant in the bush over an extended period, the chronic symptoms which Edwards was able to produce might have been developed. Later experiments by Dr. Tilley of Gladstone, Queensland, supported the conclusions arrived at by Edwards in Western Australia; and Mr. P. R. Gordon, late Chief Inspector of Stock for Queensland, informs me that since Tilley's demonstration of the poisonous effects of the young zamia shoots, "large areas of country have been abandoned on account of the growth of zamia, while paddocks in the heart of the worst Zamia-infested country have been completely cleared of the plant and with their removal the disease has disappeared."

In view of the varying character of the results of zamia-feeding experiments the author is inclined to speculate that the disease may be only produced by the eating of zamia when that plant is itself attacked by disease—possibly by a fungoid character. The instance of ergotismal abortion and other derangements being produced by the eating of rye

only when the rye heads are attacked by the *Clavicups purpurea* fungus suggests the speculation. Or, it may be that macrozamia is only poisonous at certain seasons of the year or in certain stages of growth, as is undoubtedly the case with the sorghum family, thistles, &c.

Tutu or "Toot" Poisoning in New Zealand.[1]

Of the poisonous plants of New Zealand none have caused so much loss to the agriculturist as the shrub known as "tutu,"[2] and it is stated that the existence of the shrub on the coast was one of the most formidable obstacles to the stocking of the country with cattle and sheep.[3] The animals brought by Captain Cook died in what to him was a most unaccountable manner, but the general description of the symptoms recorded by him leaves little doubt that they died of toot poisoning (Lauder Lindsay). In 1863 Lindsay states that the stock losses from this cause reached 25 per cent. Many deaths of human beings from eating tutu berries have also been recorded, and domestic fowls have also been poisoned in the same way.

There are two poisonous varieties of tutu, the "tree toot" (*Coriaria ruscifolia*) reaches a height of 20 or 25 feet, and the "ground toot" (*C. thymifolia*) a succulent shrub seldom exceeding 3 feet in height. The poisonous principle in each of the species is a crystallizable glucocide called "tutin" which exists in the plant in the proportion of one-twentieth per cent. by weight. It ranks among the most toxic of the vegetable poisons. Two grains will kill a pig, a twentieth of a grain a cat, and one-hundredth of a grain causes sickness and incapacity for twenty-four hours in a full grown man.

The SYMPTOMS exhibited in animals affected by tutu-poisoning are successively:—uneasiness, accelerated breathing, nausea, vomiting, tetanic spasms and convulsions accompanied by snoring breathing; the convulsive attacks last about a quarter of an hour and recur at intervals of about an hour at first. Later on the interval is lessened and the attacks are almost continuous. Death takes place within a few hours.

ANTIDOTE.—Lime and other alkalies have the property of neutralizing tutin and these would appear to be the rational antidotes to apply. Lindsay mentions that one of the antidotes used with good effect on sheep is carbonate of ammonia which in addition to antagonizing the poison also acts as a stimulant. The dose for a sheep under such circumstances would be from a quarter to half an ounce dissolved in cold water and given as a drench. Bleeding has also been recommended as one of the most certain and rapid methods of affording relief.

Euphorbia Drummondii.

For many years this plant commonly known as "Milkweed" was generally credited with poisonous properties. Mr. Edward Stanley F.R.C.V.S., late Chief Veterinary Inspector in New South Wales, undertook an investigation of the matter and as the tradition as to its poisonous

[1] The information given in this article is compiled from a paper by Professor Easterfield and B. C. Aston, Chemist to the New Zealand Department of Agriculture, published in the 1900 Annual Report.

[2] The Maori pronunciation of the word tutu is not unlike "toot"; by Europeans it is invariably so pronounced, and stock suffering from tutu-poisoning are said to be "tooted."

[3] The mortality from tutu-poisoning still continues, and in August, 1904, heavy losses were reported from the Walkato district. Forty-three bullocks strayed from a turnip paddock on to some rough country thickly grown with tutu: next morning forty-two of them were found dead, and there was ample evidence of their having eaten freely of the young shoots of tutu.

character has not yet been completely dispelled it may be well to quote the more important portions of his report, a revised edition of which was published in the *Agricultural Gazette of New South Wales*, September 1896. After mentioning that many losses of sheep had been attributed to the supposed poisonous properties of the plant and that many specimens of it were consequently sent to the Stock Office, Sydney, Mr. Stanley intimates that during his inquiry he failed to find any one acquainted with the symptoms of illness produced or with the *post-mortem* appearances of animals alleged to have been poisoned. The report proceeds:—

"Its evil reputation may be traced to two sources; first, under certain circumstances, to be detailed later on, it may cause fatal indigestion; secondly, botanists classify it with an acrid poisonous family, the *Euphorbiaceæ*. In structure it is allied to this group, but it has none of the caustic medicinal elements that distinguish the order.

EUPHORBIA DRUMMONDII, BOISS.

"Baron von Müeller gave the plant a bad reputation, in consequence of the known properties of the order to which it belonged, and he was confirmed in his opinion by the voluminous correspondents who inundated him with specimens of the plant and statements of losses in stock which he received year after year from all parts of Australasia. Messrs. Bailey and Gordon, in their book on "Reputed Poisonous Plants in Queensland," give this plant a very bad character, but Mr. Gordon has since refuted it.

"There can be no doubt that losses of sheep do occur from eating this plant, but there is no reason to consider it the *bête noir* of Australian herbage, as I shall prove later on. I will now give my views as a veterinarian from practical observation. I have noticed the widespread distribution and hardy nature of the plant, *Euphorbia Drummondii*, which is probably eaten by tens of thousands of sheep every day in the various Colonies of Australasia.

"It flourishes all the year round, resists drought, and rapidly shoots up after light rain, then being tender and tempting herbage. It is well known that sheep after a drought or from enforced hunger will eat greedily, gorging themselves with several young succulent plants, such as clover, lucerne, green wheat, trefoil, thistles, mallow, wild parsnip, or any other succulent green food that may be so rapidly swallowed as to distend the first stomach, then chemical action proves stronger than the vital functions, causing indigestion, fermenting in the stomach, distending the abdomen, producing mechanical pressure on the vital organs, and death from suffocation. Such deaths are not due to poison, but are purely

accidental, mechanical and not toxic. This condition has often been mistaken for poisoning, and explains, I think, the very conflicting views that have been expressed on the subject of this paper.

"Messrs. Bailey and Gordon's work gives the following botanical description of the plant:—

"*Euphorbia Drummondii*, caustic creeper. A prostrate or diffuse, milky, much-branched plant, smooth, and of a light-grey colour, or here and there stained with red; the leaves oblong or nearly round, opposite on the stems, obtuse or notched at the end, about ¼ inch long. Flower heads small, on short stalks in the axils of the leaves. Capsule smooth, the seeds rough. This little plant is met with throughout Australia, including Tasmania.

"I found the plant freely distributed over a very wide area in the Lachlan and Riverina, and noticed it cropped short, unless it was protected from sheep by a fence, as in a garden, on the railway, in a horse paddock, &c.; in such situations the plant is conspicuous, growing a foot high, being very hardy in drought, and in slight rain it grows rapidly; where sheep eat it, the plant grows close along the ground almost like a creeper.

"Near Urana a large patch of the plant grows on the stock route, where only very scanty herbage is seen for miles. Mr. Brett informed me that in October, just after rain, a drover arrived at this patch with 3,000 sheep that had been starving for three or four days previously; they stopped and ate up the patch of *Euphorbia*, and walked a mile or so on to Urana Common to water and camp. In three hours about 1,500 were lying ill over a space of ground, and 220 died before morning. Symptoms: Distended stomach, staggering gait, frothy discharge from nose and mouth, unable to rise when down. The 1,280 sufferers that survived continued to travel next day, with the others that were unaffected. This instance is valuable, because the number that died was small, and the recoveries being so large and so quick remove all suspicion of poison. For years before and since that occurred, many thousands of sheep have travelled the same road without ill effects.

EXPERIMENTS ON SHEEP WITH THE PLANTS.

"I took the opportunity of investigating the effect of this plant, on sheep, while on Yanko Station in March, 1886, by carrying out a few simple experiments.

"To the courtesy of Mr. Carse, I was indebted for the supply of sheep from a healthy flock, in which no disease had occurred, and for milk-weed, known as spurge wort, or better as *Euphorbia Drummondii*, growing plentifully in the horse paddock, and for assistance of every kind that I could possibly require for carrying out these experiments, which were greatly facilitated by my obliging assistant, Mr. Brett, Inspector of Stock. Both these gentlemen at that time believed the plant to be poisonous.

"We put up seven sheep of various ages, and I carefully examined the conditions and health of each, the skin, the conjunctiva, age, sex, pulse, temperature taken by thermometer introduced three minutes, blood examined under a microscope for baccilli, noting the state of their evacuations, and found them in perfectly good health. In most of the subjects the respirations were panting, and the heart's action too excited to be of value. The weather was hot and dry, temperature ranging from 80 degrees to 97 degrees in the shade.

"The weed was gathered fresh every day, and given to the sheep *morning and evening by three methods:—1st. In the natural state. 2nd.* Chopped into small pieces and moistened with water, it was administered with the thumb and fingers, by placing it on the roof of the tongue; it was slightly chewed and swallowed; the little water left in the pan was given as a drench after the feed; none was wasted; a pound weight of the plant was found to be too large a feed at once, but half-a-pound night and morning was taken with ease and comfort, and evidently relished; (it has an agreeable odour when drying, like new hay, and a slightly bitter taste). 3rd. Made into a decoction like tea, by steeping 2 lb. of weed in one gallon of boiling water, and covering it up one to two hours, drained off, and used when cool, it has a brownish colour, fragrant smell, and by no means an unpleasant taste. Those drenched with this decoction fed with less relish than those starved into taking the weed, but showed no nausea, lassitude, or any indication of illness.

"It may be observed that over 56 lbs. of the weed was procured fresh, and used by weight. This was reduced by evaporation and some dirt. The bulk of this weed was consumed by *six sheep* in *six days* without the slightest evidence of medicinal effect; their spirits never flagged, their general appearance was of perfect health, and their evacuations were normal in quantity, colour, and consistency throughout the experiments.

"Paddock sheep do not take kindly to pen feeding; hence, to save time, resort was had to hand-feeding and drenching. Each sheep occupied a separate pen. No food was given during the experiments, excepting a handful of saltbush and chaff, mixed with the first feed of chopped plant in the troughs to tempt them to eat. Water to drink was constantly provided in pans, excepting while drenching with the decoction.

"On the third day of the experiments the crossbred ewe dropped a male lamb fully developed, and cleansed at once (not abortion). Both were perfectly robust and healthy, the ewe feeding ravenously on the *green fresh succulent plant, without any other food whatever, and giving* plenty of milk. She reared the lamb.

"This was the triumph of the tests, as it not only proved that no poison was in the plant, or the milk would have become contaminated; and also demonstrated that the plant was wholesome and nutritious herbage.

"Subsequently, two years later, I repeated experiments with this plant, by feeding starving sheep upon it for several consecutive days, with some sheep using the plant green and fresh, and on others dry, some sheep living on the plant alone, others taking it with other food. Rabbits and guinea-pigs also eat it. In every instance it proved to be a good nutritious feeding plant.

"To ascertain if it had any caustic or irritant properties, I introduced the milky juice into the eyes of sheep, and dogs, and applied it to the skin of sheep, in every instance without being able to detect the slightest caustic or irritant action, either from its internal or external use.

"In order to have the plant examined, I made an extract and also a tincture for analysis in the laboratory, and handed them to the Government Analyst, with a bundle of the plant, with the following result:—

"Mr. Hamlet, the Government Analyst, 2nd August, 1886, reported on *Euphorbia Drummondii:* 'The samples of plant, extracts, and tincture, sent by you in April last, have been found to contain an alkaloid or

crystalline body, capable of giving the usual alkaloid reactions and having a bitter astringent taste. As far as it was possible to ascertain, no poisonous properties were observed.'

"To confirm this, I gave the concentrated alkaloid, to a sheep, undiluted. He simply turned away and went on grazing, and did not show any symptoms of inconvenience whatever. *These experiments and observations quite satisfied me that no poison exists in the plant Euphorbia Drummondii.*"

In an appendix to his report Mr. Stanley puts forward in support of his conclusions the experiences of a number of stock-owners as follows:—

"In order to confirm my opinion, I have, from time to time, asked stock-owners to make careful observations of its effects under ordinary conditions on their runs, and having received written statements that support my views, I annex extracts from their letters, and take this opportunity of thanking them for courteously supplying the information. The Queensland authorities were very strong in their opinions of its being a fatal and poisonous weed; but, judging from a recent letter, the views of Mr. Chief-Inspector Gordon are changing. He says—'We have immense quantities of *Euphorbia Drummondii* in Queensland, and sheep eat it in any quantity, and with no evil results.'

Messrs. Devlin and Co., Ganmain:—"Our sheep have picked out this weed from amongst other grass, and have eaten it ravenously, and no ill effects have resulted. Sheep have been fed exclusively on this weed with no ill effects. The herbage in the paddocks where the milking-cows were kept last year was chiefly composed of this weed, and no harm resulted."

Mr. J. Holloway, Mumbledool:—"It is first-rate feed for our station sheep. During the drought this run was badly off for feed, and stock were very weak. In several small paddocks which had been eaten completely out, and the sheep removed, after a long spell and a little rain this plant came up and grew luxuriantly, spreading in some instances to 12 inches from the centre. Into one of these paddocks I put a few hundred of our best ewes; they were very hungry, famishing in fact, and were yarded the previous night; they ate the *Euphorbia Drummondii* ravenously, and had a good bellyful right away, without seeking for anything else. These sheep were left in the same paddocks for weeks, and did first rate the whole time, although there was little or nothing but the plant in question for them. I am satisfied it is in no way injurious to sheep, and consider it a good, useful plant."

Mr. J. E. Warby, Billenbah:—"This plant grows more or less over my estate of 8,000 acres, and on 50 acres that had been irrigated it grew very abundantly, from plants half the size of the hand to a foot in diameter. I have had horses, cattle, and sheep—five or six to the acre—in the paddock for several weeks at a stretch, and have noticed cattle and sheep eat large mouthfuls of it, and none of my stock suffered from it in any way."

Mr. D. McLarty, Bundure:—"There is a large quantity of the plant growing over the run here, and when other feeds were scarce stock could get plenty of this said poisonous plant. I never considered it poisonous, and never saw any bad results from it."

Mr. P. R. Brett, Inspector of Stock, Urana, formerly believed the plant to be poisonous, and consequently has taken a good deal of trouble,

and made several experiments to satisfy himself. He shut up 400 wethers in a yard for two days, and then turned them into a paddock full of this weed, and next day he could not find one sick sheep, and he says:—"The fact is, in place of this plant being a poisonous one, I think it is a very valuable one, being the first to show above ground after summer rain. A small lot of sheep for killing purposes are doing very well on this weed and crowsfoot, no grass."

Mr. Geo. Faithfull, Brewarrina:—"I have frequently observed cattle eating it in large quantities, and have watched individuals, but have never observed any effects. It cannot be poisonous, or numbers of my cattle would die."

Mr. J. H. Spiller, Tubbo:—"My experience proves that it is perfectly harmless. I had a paddock covered with it, and was afraid to put sheep in: at last I ventured to do so; the sheep ate it, and thrived well on it."

Mr. David McCaughey, Coree:—"I have a great deal of this so-called poison plant on the run, and never find any loss of stock or bad effect from them eating it. Paddocks that have had a spell, after the first summer rains, throw up an immense quantity of this milk-weed. I generally put my most valuable sheep in these paddocks, and find they do splendidly on the fresh green feed, of which this milk-weed forms a very large proportion."

Mr. Angus Robertson, Yarrabee Park:—"As to the so-called poison plant, I have really known sheep to thrive on it."

Mr. Arthur Devlin, Uarah:—"I penned some sheep, and fed them on *Euphorbia Drummondii* for about a week. They appeared to be very partial to it, and were thriving on it. I also put a large number of sheep into a paddock where there was an abundance of it growing very luxuriantly, and the sheep devoured it without any injurious effect."

Mr. J. A. Gunn, Yalgogrin Station:—"I have seen the ground covered with the plant after autumn rains, before grass had time to spring, and sheep feeding on very little else for weeks without the slightest harm resulting, either to station stock or to travelling sheep."

Mr. W. J. Elworthy, Inspector of Stock, Narrandera:—"The plant was growing all over the recreation reserve, and I watched to see its effects on a flock of sheep that had eaten it, but no ill results followed."

The Department of Agriculture of South Australia in 1903 fed sheep in pens on this plant without injury, and concluded that although the plant had undoubtedly been responsible for many deaths in large and small stock it would appear to be mostly dangerous to travelling stock and stock that were not used to it. It was considered a safe practice to put stock on it as soon as it appears, the stock then getting accustomed to it before it becomes plentiful.

Strychnine Poisoning.

Amongst animals strychnine poisoning occurs most frequently in dogs which have picked up poison baits laid for rats or other vermin. The characteristic SYMPTOM is the occurrence of muscular spasms or twitchings, which, in cases where a large dose of poison has been ingested, take the form of tetanic convulsions. Gerlach's observation that small animals recover from the convulsive attacks as soon as they are placed in standing position has not been generally corroborated.

TREATMENT.—Chloral hydrate which subdues the spasm is the appropriate physiological antidote. Dogs should be induced to vomit by the giving of salt and water. Putting the animal under chloroform is sometimes advisable. Solution of tannin may be given or a cupful of strong cold tea if nothing else is to hand.

Nightshade or Belladonna Poisoning.

Many deaths of cattle have been vaguely attributed to "nightshade" poisoning. The plant usually held responsible is the Black Nightshade (*Solanum nigrum*) concerning which the Victorian Government Botanist recently reported as follows:—"An almost cosmopolitan weed, either indigenous or immigrated. The berries if ripe appear to be quite harmless and are sometimes eaten by children without any ill effects. The plant has in a few instances been sent to me as a suspected poison plant but we have no reliable evidence that it has proved fatal. All stock seem to avoid it either on account of its somewhat disagreeable smell or because it is not palatable or by instinct. The word "nightshade" frequently leads people to associate the above weed with the "Deadly nightshade" (*Atropa Belladonna*) a very powerful poison plant."

In BELLADONNA poisoning, through the eating of the leaves or berries of the *Atropa Belladonna*, the principal symptoms in cattle are staggering gait, paralysis, and slow respiration. Death occurs rapidly. Tannin is the appropriate antidote and stimulants should be given.

Potato Poisoning.

Occasionally young cattle and, very occasionally, horses are poisoned by eating potatoes, particularly "greened" potatoes which have been exposed to the sun, and sprouting potatoes which have been kept in the dark. The symptoms are those of colic, followed by a staggering gait, tremors of the muscles and distension of the abdomen. In some cases there is superpurgation and in other cases constipation, and these two symptoms have been taken as serving to distinguish two forms of potato poisoning. One form in which the exhibition of pain and purgation are the prominent symptoms is caused by an active poisonous principle in greened potatoes called *solanine* which is an irritant poison. The other form of potato poisoning is in the nature of a rapid fermentation giving rise to the production of a nerve poison (ptomaine), and flatulence, constipation and loss of muscular control are then associated symptoms.

TREATMENT.—Sedatives such as laudanum and belladonna in the first form and ammonia stimulants succeeded by laxatives and nerve stimulants (strychnine) in the other form are the appropriate remedies.

Stinkwort Poisoning in Sheep.

There seems to be very fair evidence that in some parts of South Australia the noxious weed known as Stinkwort, when in the flowering stage, is fatal to ewes heavy in lamb. During the months of April and May there is every year in some localities a great mortality amongst breeding ewes grazing in paddocks which contain stinkwort and the deaths are stated to almost invariably cease when the sheep are removed to land free from the weed. Sometimes young sheep of either sex are affected.

PREVENTION.—Removal of sheep before the weed has run to flower.

TREATMENT.—Mr. C. J. Valentine, late Chief Inspector of Stock in South Australia, who has had extensive experience of the trouble, recommends the giving of a drench composed of Epsom salts, 4 ounces; molasses or coarse sugar, 4 ounces; ginger, ½ ounce; and half a pint of linseed tea. For 200 sheep the drench may be made in bulk in the proportion of 50 lbs. of each of the two former constituents, 3 lbs. of ginger and 12½ gallons of water.

Yellow Rash-Lily Poisoning.

This bulbous plant which grows vigorously on poor land in some seasons is a member of the Iris family, and has at various times been held responsible for the deaths of sheep. The most recent instance was reported in December, 1903, by Mr. H. W. Potts, Principal of the Hawkesbury Agricultural College, New South Wales. Six sheep died suddenly in a paddock extensively infested with the weed and, after eliminating every other probable cause, the conclusion was arrived at by Mr. Stuart Pottie, M.R.C.V.S., the College Veterinary Surgeon, that the deaths resulted from eating the yellow rash-lily, seeds and heads of which were found in the fourth stomach. That the plant had been extensively eaten by the sheep was evidenced by the number of plants found cropped close to the ground.

Castor Oil Plant. (*Ricinus communis*).

Occasionally cattle are poisoned by eating the young shoots and leaves of the castor oil plant which flourishes throughout the States. The poison is not an alkaloid or organic acid, but is an albumenoid ferment called "ricina," which, when separated, is a white odorless powder having a more intense poisonous action than arsenic. This action is explained by an extraordinary power of agglutinating the blood which ricina possesses. Ricina is not present in the purgative oil, but remains in the crushed seed, hence the poisonous properties of castor cake. Cosco records that in one regiment of cavalry in the Italian army where castor cake was used 296 horses were affected and eleven died.

Indian Mutter or Vetch. (*Lathyrus sativa*).

This plant contains a poison which has a special action on the nerve supply of the larynx causing paralysis of the laryngeal muscles and roaring. The poison is a cumulative one, and its effects may not be observed until some time after the plant has been continuously eaten, but its effect is not necessarily permanent. Sometimes however the animals are taken ill suddenly and die in a few minutes—on recovery all symptoms of roaring disappear.

Aconite or Monkshood. (*Aconitum Napellus*).

The common Tincture of Aconite is prepared from this plant. It is strongly poisonous by virtue of the alkaloidal active principle *aconitine* which it contains. Deaths of stock have been occasionally reported through eating garden refuse containing withered monkshood.

Hellebore. (*Helleborus niger, veridis and fortidus*).

Hemlock. (*Conium maculatum, Æthusa Cynapium* and *Cicuta Virosa*).

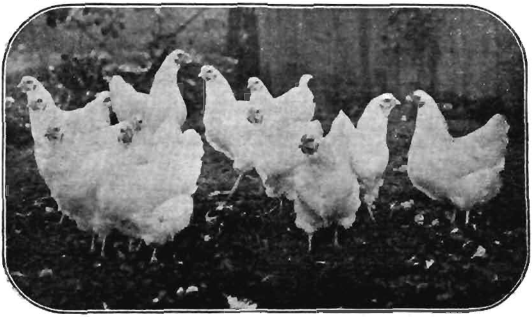
UTILITY POULTRY KEEPING.

A Successful Industry.

A. Hart, Poultry Expert.

VALUABLE ADJUNCT TO THE FARM.

The poultry industry presents many possibilities and probabilities which affect poultry keeping to a greater or lesser extent. The opinion is often expressed that there is money in poultry, and my own ideas are certainly with those who make the statement. But it must be borne in mind that, although this may be quite correct, there are cases where poultry-keepers have failed. While admitting that these failures may have been influenced to a certain extent by the poultry kept, I am inclined to think that the greater weight of evidence would be against the poultry-keepers themselves.



AMERICAN WHITE WYANDOTTES.

Noted for their table properties and egg production. Bred by Mr. G. E. Andrew, Ormond Poultry Farm, Ormond.

That poultry can be made a success is quite certain, and many instances could be given in support of this statement. But the strongest point in favour of poultry keeping is that it can be practised as an adjunct to the farm, dairy or garden. It is in this form that I would strongly recommend poultry breeding. To the farmer I would say, keep poultry, for the dairyman I would advise a combination of poultry with dairying, and to the fruit-grower I would suggest that fruit-growing and egg-production could be successfully carried out. In each and every calling there is ample room for the inclusion of poultry breeding, and the latter industry will fit in admirably with any or all of the three industries. Poultry kept on a farm can be fed at a comparatively low cost, as nearly the whole of the food required can be produced from the land. This not only lessens the cost of food by securing it on the spot at wholesale market value, but it also allows of the products of the farm being marketed in a concentrated form in the shape of eggs and chickens,

lessening the cost of transit and bringing in a regular return right throughout the year. The poultry manure can also be reckoned as of considerable value. It can be used with advantage either as top dressing or root fertilizing for root, vegetable, or other crops.

Dairying is almost always carried on in connexion with farming, and the three industries will work well together. Fruit-growing is not, as a rule, associated with farming or dairying to any great extent. But where space is available, and the situation and surroundings are suitable, the combined industries of farming, dairying, fruit-growing and poultry keeping should make a very valuable combination.

Does Egg Production Pay?

This question may be answered in the affirmative, especially so when worked in conjunction with other industries. The results of the Government egg-laying competition in the States of New South Wales, South Australia, and Queensland for 12 months are here given in tabulated form and fully support the answer given to the foregoing query:—

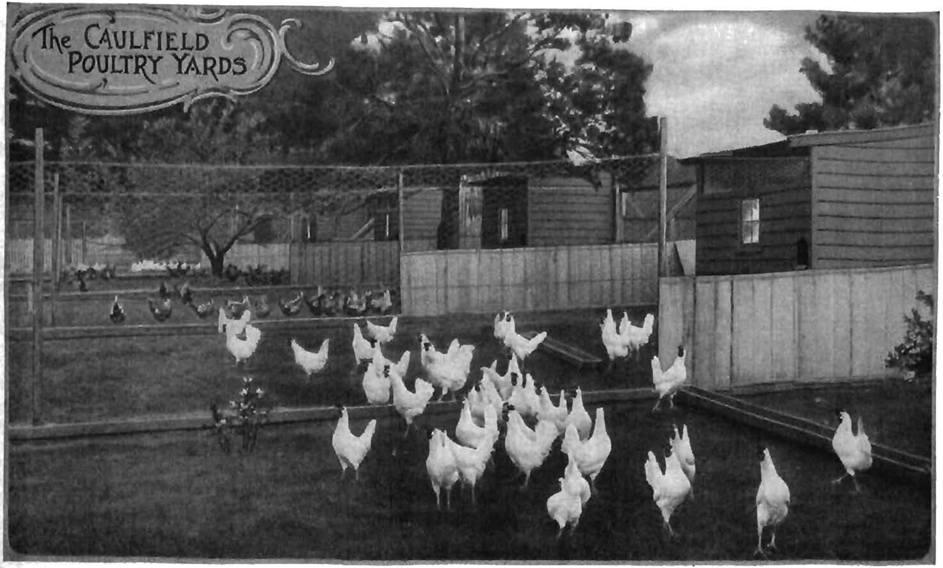
Competition.	Number of Birds that competed.	Number of Eggs laid.	Cost of Food.	Net Profit.	Average Number of Eggs laid by each Hen.	Cost of Food for each Hen.	Net Profit for each Hen
			£ s. d.	£ s. d.		s. d.	s. d.
New South Wales	360	62,318	126 10 0	182 14 1	173	7 0	10 2
Queensland ..	168	30,543	39 9 1	85 2 5	181	4 8½	10 1½
South Australia ..	450	80,959	120 18 5	142 10 0	179	5 4	6 4
Totals ..	978	173,820	286 17 6	410 6 6			

The average price realized for the eggs laid by the 978 birds was 11d. per doz.

Nine hundred and seventy-eight pullets, in pens containing six birds each, took part in these tests. The whole of them averaged 177 eggs each for the 12 months. The cost of the food was £286 17s. 6d., and the net profit made up a total of £410 6s. 6d., being about 8s. 10d. per bird. This result was affected by the fact that the eggs from the South Australian test were put down at a lower estimate in comparison with the prices ruling in this State and in New South Wales, the egg market being always lower in the first-named State. Of course these results are from selected birds. But it must be remembered that many of the competing pens put up a very poor performance and were very low down on the list. The breeds included in these tests were Leghorns, Wyandottes, Orpingtons, Minorcas, Andalusians, Langshans, and Hamburgs. These figures must be regarded as very satisfactory, and, although the poultry-keeper would have to reckon the cost of attendance, there would still be a good margin of profit.

Starting.

As with any other industry, the main point towards success is to start right. There are many points in this respect that have to be considered, and, although they may not appear of great importance to the amateur, these details demand strict observance if profitable poultry-keeping is the aim. The first point is that the attendant should take a keen interest in the stock he is looking after. Experience is another element that is wanted. This has to be acquired, and, although studying poultry books may furnish plenty of theory, practice is worth more, and a combination


The CAULFIELD POULTRY YARDS

of one's own experience with the hints of poultry writers should be safe ground to work upon. Many other requirements, such as proper food, regularity in feeding, selection of stock, housing, penning, and other surroundings, should all receive consideration. Situation of poultry yards, climatic influences, &c., must all be thought out carefully. It may appear somewhat difficult to comply with all these essentials, but if anything is worth doing at all it is worth doing well. Starting on correct lines will lighten the work afterwards and must certainly have a very marked influence on the success of the undertaking.

BREEDS TO KEEP.

In selecting stock to form the foundation of the general flock, the first question is what is the principal requirement. If eggs are to be the source of revenue then the best egg-producing breeds must be chosen. If table poultry is wanted then the best breeds for that purpose must be selected. As the production of eggs is generally the most profitable to the poultry-keeper, I would advise that breeds with high egg-producing qualities be secured. Of course, when space is available, both egg-producing and table varieties may be kept. Breeds which possess both qualities to a certain extent may also be chosen.

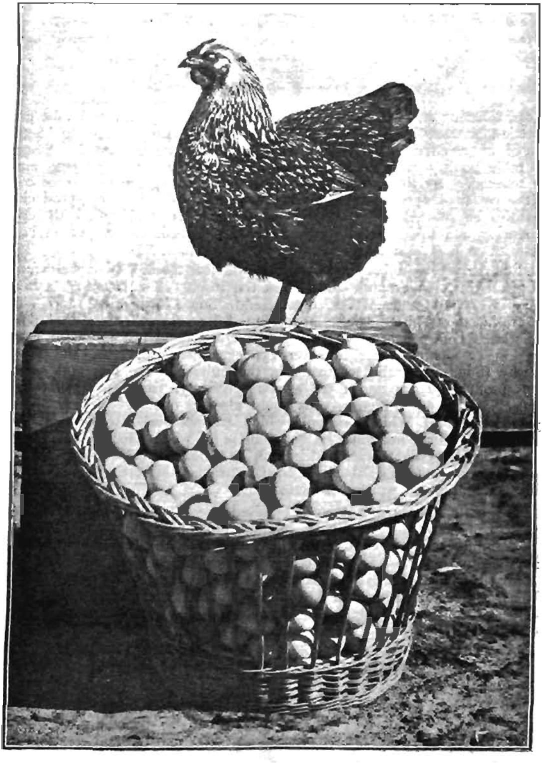
For the very best breed for EGG PRODUCTION the White Legborn must be given the premier position. From the results of 12 months' tests in Victoria, New South Wales, Queensland, South Australia, and West Australia, the White Leghorn has asserted its superiority over all other varieties. One pen of six pullets in the Queensland test produced 1,538 eggs in 12 months, averaging over 256 eggs per bird. At the Roseworthy (South Australia) competition, the pullets in the first and second pens produced 1,531 and 1,528 eggs respectively, from each pen of six birds. Many other high records could also be quoted. There are of course strains of White Leghorns which are not such prolific egg producers, and this point must be borne in mind when selecting stock.

Of the other light breeds which can be recommended for egg production, Brown, Buff, and Black Leghorns, Anconas, Minorcas, Andalusians, and Hamburgs are worthy of notice.

If a GENERAL PURPOSE FOWL is required, the Wyandotte must be placed in the front rank. The Silver, White, Columbian, and Golden varieties are certainly the best of this family. But as with Leghorns, there are some strains much better than others for egg production, and care must be taken to choose birds which are good in this respect, as well as being typical specimens of the breed. The varieties mentioned develop at an early age, and are so plump and shapely that they can be placed on the market when very young. This is a point in their favour as the cockerels can be sold when 10 to 14 weeks old, providing they are in good condition. For a general purpose fowl, either Silver or White Wyandottes should be selected.

In the heavy breeds, which include Orpingtons, Plymouth Rocks, Langshans, Dorkings, &c., the first named can be placed in the premier position. The Black are quick growers, very hardy, and develop into large and shapely birds. They are also very good layers as pullets, and when not allowed to put on too much fat, will also lay fairly well during their second year. They make a first class table fowl, and although not possessing the orthodox white, pink, or yellow shanks which

are so popular in the Home market, their other good qualities must always make them a favourite. White and Buff Orpingtons are also really good useful fowls, and the former bids fair to run the black variety very close for popularity.



SILVER WYANDOTTE PULLET.

Laid 263 eggs in twelve months. Property of Mr. E. A. Noble, Model Poultry Farm, Black Rock.

Plymouth Rock is also a breed which has improved in all-round qualities during the past few years. Several breeders have imported high class stock from America, that are not only good table birds, but have also proved themselves exceptionally prolific egg producers. This combination must bring them into a prominent position. The yellow shanks of the Rocks were at one time against them as table birds, but this has changed, and they are now quite as saleable in London and Manchester as either white or pink legged birds.

Langshans are very good layers, and the young stock are hardy and easily reared. They are, however, somewhat slow in developing, and for this reason the young birds have to be kept rather long before they are ready for market.

AMERICAN PLYMOUTH ROCKS.

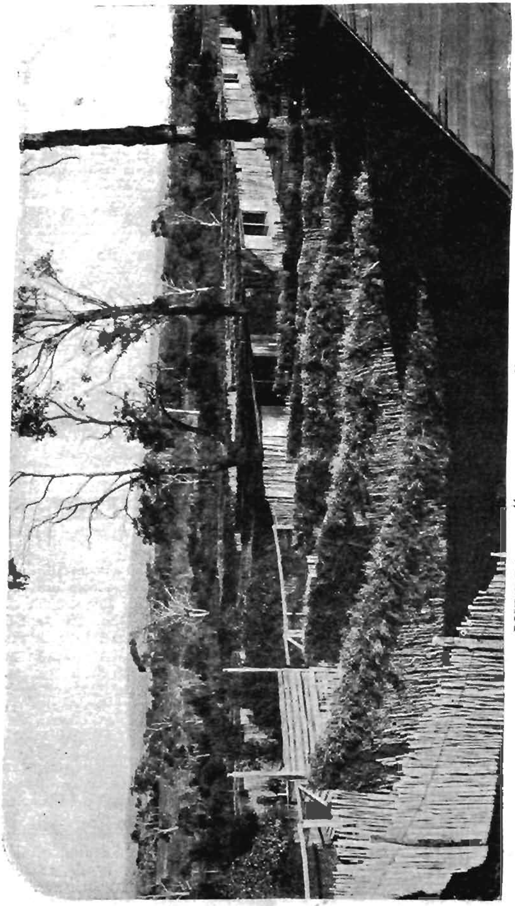
Good winter layers, and noted for their table properties. Imported by Mr. G. E. Andrew.

Dorkings are certainly a breed which carry a fair amount of flesh. Some strains of this variety are also fair layers, while others are very inferior. As chickens they give their owners considerable trouble in rearing. Although one of the oldest English breeds they are kept in very occasional instances in our State, and in numbers are very far behind all of the breeds of recent production. When all things are favorable Dorkings succeed very well.

The game family includes a number of varieties, the strongest point in favour of them all being their table qualities, but as layers they are not as good as the breeds already mentioned.

AGE OF BIRDS.

When a hen has completed her second laying season it is, as a general rule, the best plan to get rid of her, and replace her with a pullet. There may be, perhaps, an occasional case where this rule may be broken, but it should only be where an extra good egg producer is concerned. The following table gives the result of an egg-laying competition for second season hens held last year at the Hawkesbury Agricultural College (N.S.W.). It will be seen that the 240 hens averaged nearly 124 eggs each for the 12 months, while the 978 pullets in the competition previously referred to averaged 177 eggs each for the same time, being 53 eggs more from each pullet for the 12 months.



POULTRY YARDS, "HALTON GRANGE," LANG LANG.

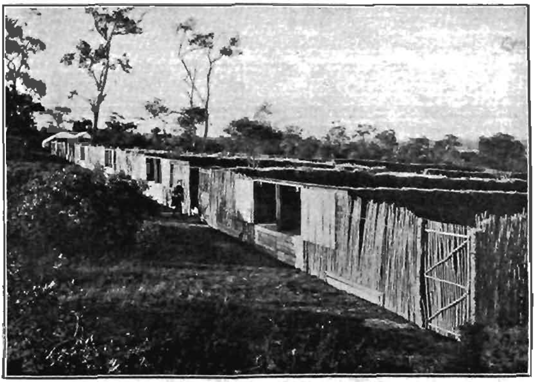
EGG-LAYING COMPETITION, SECOND SEASON HENS.

Number of Hens.	Number of Eggs laid.	Cost of Feed.	Net Profit.	Average Number of eggs laid by each Hen.	Cost of Feed for each Hen.	Net Profit for each Hen.
		£ s. d.	£ s. d.		s. d.	s. d.
240	29,756	76 0 0	74 12 9	124	6 4	6 2½

This should be a strong argument in favour of pullets for the laying flock, and the poultry-keeper will find it best to select pullets, making no exception.

SITE FOR YARDS.

Select a suitable place with an easterly slope. In erecting pens or yards, they should be made so as to accommodate 12 fowls, as they will do better when kept in small flocks. A suitable size for the house is 9 ft. 6 in. by 5 ft.; this will allow 6 ft. for the scratching shed, which is an essential for egg production. They can be made of Jarrah palings or hard or soft wood weatherboards with iron roof. The size of each run should be about 20 by 45 feet.



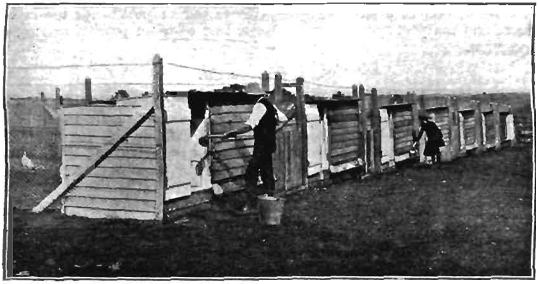
ANOTHER SET OF YARDS AT "HALTON GRANGE" POULTRY FARM.

All yards should be provided with a dust bath consisting of wood ashes, sand, and sulphur. Shelter should be provided to protect the birds from the cold winds as well as the rays of the summer sun. A liberal supply of gravel, shell grit, and charcoal or wood cinders should be given.

The supply of fresh water is very important. The water should be kept in vessels which should be shaded and placed so that the fowls cannot soil them. Fresh water is essential, both for health and egg production, and care must be taken to provide it regularly.

The yards should be turned over two or three times a year with spade or plough so as to provide fresh and clean ground for the fowls.

One of the best methods of providing shelter is to plant tree lucerne in the yards. If these trees are trimmed from the top so as to keep the foliage close to the ground, green food as well as shade will be available.



FOWL HOUSES AND SCRATCHING SHEDS.

Messrs. T. K. Bennett and Woolcock's Fairview Poultry Farm, Keilor.

Photographs of yards on the poultry farms of Mr. A. N. Pearson, "Halton Grange," Lang Lang, and Messrs. T. K. Bennett & Woolcock, "Fairview," Keilor, are reproduced in connexion with this article. These yards, and also those of Mrs. A. J. Duncan's "Caulfield Poultry Farm," East Malvern, depicted in the coloured plate, were laid out under the supervision of the Department of Agriculture.

Selection of Stock.

Purchase your birds from reliable breeders. The pullets should be of high egg-producing strain (200 or more eggs). By selecting strong, vigorous, and early-hatched pullets you should get a regular supply of eggs. The male birds should be chosen with care, and should be of best laying strains available. About seven or eight hens may be placed with one male bird. If two male birds are purchased for each pen they can be placed in the pen during each alternate month and this procedure will insure fertile eggs and strong chickens. If two or three pens of this kind are put up, it will give the opportunity of breeding the laying stock required, and it will also allow the owner to gain experience before keeping a larger quantity of fowls.

Food.

The best staple food for poultry is certainly wheat. Good heavy Algerian oats come next; maize, peas, and barley are also useful.

The morning meal should consist of two parts of pollard, one of bran, and one of lucerne chaff. The chaff should be scalded with boiling water

twelve hours before being used, being kept tightly covered for that time. This can be given warm in winter and cold in summer. Mix it in a crumbly form. About 3 ozs. per bird is a fair ration, but the quantity of food given should be varied according to breed and appetite. Green food or roots chopped finely may be given in the middle of the day.

The evening meal should be of grain. Wheat should be the principal grain, but oats, maize, peas, or barley may be given as a change. If the grain is scattered amongst litter such as short straw or pine needles, it will give the fowls exercise in scratching for it. During the winter months, maize or oats may be given more frequently, as they are of a heating nature. The following table shows the composition of the various grains and meal*:—

Name of Food.	Albuminoids or Flesh Formers.	Fats or Oils.	Carbo-Hydrates.	Salts and Minerals.	Husk or Fibre.	Water.
Wheat	12·00	1·80	70·10	1·80	2·30	12·00
Oats	15·00	5·50	48·00	2·50	19·00	10·00
Barley	12·00	1·40	50·00	3·60	14·00	13·00
Maize	10·50	8·00	66·00	1·50	2·50	11·00
Peas and Beans ...	24·00	1·50	48·00	2·50	10·00	14·00
Linseed	22·50	33·70	23·20	4·30	7·10	9·20
Pollard	15·00	4·00	57·00	4·50	4·50	14·00
Bran	15·50	4·00	44·00	6·00	16·50	14·00
Blood Meal	84·30	2·50	...	4·70	...	8·50
Green Bone	20·00	26·10	..	24·00	...	20·90

In purchasing grain, always lay in a stock when the market is at its lowest. The best quality is always the cheapest in the end.

Thousand headed kale is a good green food. Lucerne, red clover, lettuce, and silver beet are also very suitable. With plenty of water a succession of green food can be obtained.

Animal food in the shape of green cut bone, blood meal, and meat scraps is a valuable aid to egg production, but should not be given to excess. About one pound of green bone or blood meal may be given to twenty hens two or three times a week.

Regularity in feeding must be practised, and fowls should never be allowed to miss a meal.

THE VALUE OF THE HEN.

According to a Bulletin of experimental station work issued by the United States Department of Agriculture, the dried grain of wheat contains about 15 per cent. water, 2.1 per cent. nitrogen, 9/10ths of 1 per cent phosphoric acid, ⅝ths of 1 per cent. potassium oxide. One hundred pound of wheat sold off the farm carries away about 15 lbs. of water, 2 lbs. 6 ozs nitrogen, over 14 ozs. of phosphoric acid, and nearly 10 ozs. of potash Professor Henry, in his work on *Feeds and Feeding*, gives the amoun somewhat differently. In 1,000 lbs. of wheat there are 150 lbs. of water 23.6 lbs. of nitrogen, 7.9 lbs. of phosphoric acid, and 5 lbs. of potash.

Farmers' Bulletin (U.S.A.), No. 128, gives the composition of hens eggs:—Shell, 11 per cent.; water, 65½ per cent.; protein, 11.9 per cent. fat, 9.3 per cent. Then 100 lbs. of eggs contain 11 lbs. of shells, mostl lime, and 65½ lbs. of water. Neither contains the costly elements o

* This table gives the total percentages present in each kind of food. Probably about two-thirds of these are digested by birds.

fertility—potash, phosphorous, and nitrogen. Neither do the fats and carbo-hydrates contain those elements, being composed of carbon, hydrogen, and oxygen, in varying proportions. Protein—the muscle and tissue builder—contains carbon, hydrogen, oxygen, nitrogen, and sulphur in varying proportions.

In 100 lbs. of wheat the farmer sells 11.4 lbs. of protein; in 100 lbs. of eggs he sells 11.9 lbs. of protein. He sells 71.8 lbs. of nitrogen-free extract, or carbo-hydrates composed of starch, gum, sugar, &c., in the wheat and none in the eggs. Eleven pounds of shells are sold in each 100 lbs. of eggs, but none are contained in the wheat. He sells 2 lbs. 3 ozs. of fat in the wheat; 9 lb. 5 ozs. in the eggs. This fat is carbon, hydrogen, and oxygen, all of which are largely drawn from the two free and abundant elements—air and water. He sells 2 lbs. 6 ozs. nitrogen in wheat, probably about the same in the eggs; about 13 ozs. of phosphoric acid and ½ lb. of potash in the wheat, but only a trace of each in the eggs.

By the foregoing it will be readily seen that the farmer sells the fertility away from his farm—nitrogen, phosphorous, potash—in selling wheat. With the eggs he sells lime, water, oxygen, hydrogen, carbon, and some nitrogen. The hen returns the elements not derived from air and water back to the soil. Then feed the wheat to hens—4 ozs. of wheat per hen is a large daily ration. The experiment stations figure on much less. The 100 lbs. of wheat feeds a hen 400 days—call it a year. We may safely say that the wheat with fairly good management will yield 100 per cent. profit if turned into egg production. Moreover, you have the hen left at the end of the year. The hen has returned fertility to the soil—wheat robbed it for ever.

Success in Egg Production.

SYSTEMATIC FEEDING AT DOOKIE AGRICULTURAL COLLEGE.

(From the Report of the Principal, Mr. Hugh Pye.)

FEEDING, ETC.

TABLE OF A SUCCESSFUL DAILY RATION FOR 222 BIRDS.

Proportion by weight of Food.	Constituents of Food.	Weight of Food per day.
8 Parts	Wheat	24 lbs.
2 "	Bran	6 "
5 "	Pollard	15 "
1 Part	Chaff (Wheaten)	3 "
1 "	Meat Scraps	3 "
5 Parts	Water	15 "

Fresh water is supplied every day, and on extra hot days twice. Shell grit is the principal form of grit supplied. Litter in the form of straw is also present, amongst which the grain is thrown. The objects of the litter in the pens are principally to give exercise and to keep the birds from eating their food too rapidly. Straw litter also acts as a mulch, especially in summer, to keep the ground cool and as moist as possible, and secondly, to encourage a certain amount of insect life for the birds. The litter when removed can be used for ameliorating the mechanical condition of the soil where trees are planted, and contains a certain amount of fertilising matter also.

Preparation of the Mash.—The quantities of the different constituents of the mash being weighed out, the pollard and bran are put in the trough which is 4 ft. 6 in. long by 3 feet wide by 12 inches deep. The pollard and bran are then mixed up, and chaff (steeped over night until soft and pliable) or chaffed green stuff is added. All are then well mixed together and put at one end of the trough. Then the meat scraps and soup are placed on top of the mixture, and a little at a time is worked into a nice mealy mash, comparatively dry, but just moist enough to enable the birds to eat it without any trouble or waste.

Green Food.—The green food consists principally of kale, lucerne, silver beet, and rape.

COMPARISON OF FOODS.

It is by comparing the action of the nitrogenous or flesh-forming foods, with the heat givers, or those of a starchy or fatty nature, that the importance of adopting a rational system of feeding is brought under notice. It was noticed that, when much starchy food was given to the laying hens, they did not lay nearly as well as when animal food was mixed with it, also that growing animals did not thrive unless the starchy and flesh-forming foods were present in the daily ration in proper proportions. This relation between the digestible protein or nitrogenous matter and the digestible carbo-hydrates and fat in a food is known as the nutritive ratio. It will be seen that, to compare the protein with the carbo-hydrates and fat, it is necessary to reduce these two to some common term.

It is found that the heat energy of 1 lb. of fat is equivalent to that of almost 2.3 lbs. of starch; thus if the amount of fat in a percentage composition be multiplied by 2.3 it enables us to add the product to the percentage of starch given, as both are now in similar terms. The list of foods to be mixed being given, and the parts of each supplied to compose the ration being noted, recourse must be had to the table of analyses of the foods giving the percentage of digestible nutrients. To the amounts of carbo-hydrates are added the equivalents, in carbo-hydrates, of the fat. This, as already explained, is obtained by multiplying the total digestive percentage of fats by 2.3, since one part of fat supplies as much heat energy as 2.3 parts of starch. Then to find the nutritive ratio of barley we look at the food tables and note that in the protein column it states 9.64, in the carbo-hydrates column 60.77, and in the fat column 1.86 Then the latter two are added, after reducing the fat to carbo-hydrate equivalents, and the total sum is divided by the amount of digestible protein, which gives us a nutritive ratio of 6.7. If there be two parts barley in a mixture, then the co-efficients are multiplied by 2.

TABLE GIVING THE APPROXIMATE NUTRITIVE RATIOS OF THE MORNING AND AFTERNOON RATIONS AS A WHOLE.

Parts by Weight.	Constituents of Rations.	Digestible Protein (Nitrogenous) Matter.		Digestible Carbo-hydrates (Starch, &c.).		Digestible Fats and Oils. 1 Fat. 2.3 Starch.		Nutritive Ratio.
1	Wheaten Chaff ..	..	3.90	..	46.1	..	1.10	} 1 : 3.48
1	Meat Scraps, &c.	..	45.00	..		..	2.00	
2	Bran ..	2 × 11.2	22.40	2 × 42.2	84.4	2 × 2.5	5.00	
5	Pollard ..	5 × 12.2	61.00	5 × 53.4	267.0	5 × 3.8	19.00	
8	Wheat ..	8 × 10.2	81.60	8 × 69.2	553.6	8 × 1.7	13.60	1 : 7.16
	Total ..		213.60		951.1		40.70	1 : 4.19

The nutritive ratio of the morning mash is perhaps narrower than some are used to give to laying hens, but undoubtedly the excellent returns from the hens encourage me to believe that, in practice at least, it has been a success. The wheat ration may seem to have too wide a nutritive ratio, but I do not think the bulk wheat of the State has a much narrower one. A nutritive ratio of 1 :4.5 is considered by many English breeders about right, or the normal ratio. The term "narrow ration" is used to denote that the proportion of protein present in the food is higher than the normal, and the ration is said to be "wide" when the proportion of protein is less, or that the carbo-hydrates are in greater quantities than in the normal.

The difficulty of obtaining the correct nutritive co-efficients of the constituents of the rations make such tables less reliable for fowls than for cattle, yet they serve a useful purpose in concentrating thought on the subject, and the feeding done is less empirical, and so less liable to mistakes. It is only within recent years that close attention has been given to the scientific feeding of poultry, and then only to a limited extent. The alimentation of poultry is so different to that of cattle, on which much research work has been based, that we can only hope for approximately correct results. We must supply a "maintenance ration" in order to keep the birds alive, *i.e.*, replace waste tissues and keep up the body heat.

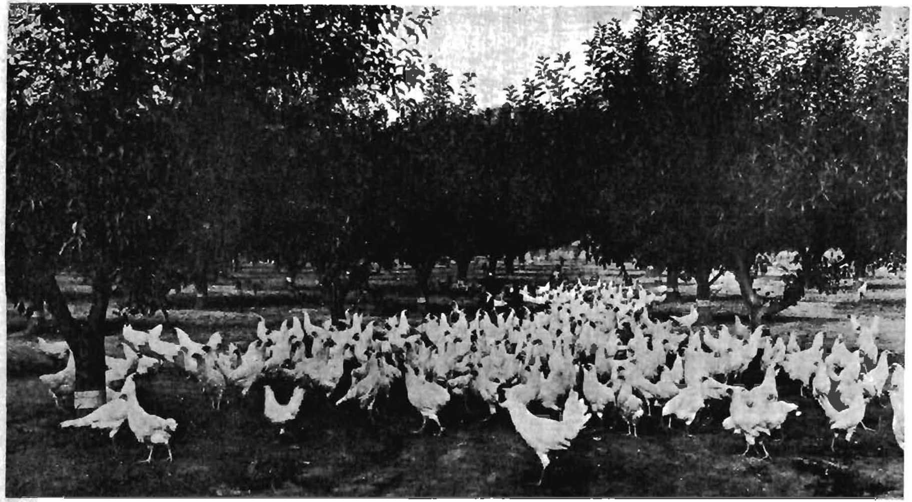
We must also supply the necessary surplus for the making of an egg for at least 200 days during a year. If it can be managed to rear a strain of birds that lays 250 eggs in a year then greater prosperity is possible for the owner. It is possible by continued selection to intensify the tendency to regular and continuous egg production, which formed the characteristic of the individual hen which was originally selected in starting the present strains. Hence the type of prolific layers will take characteristic qualities as do good milkers among cows. From the results obtained it is evident that it is the strain and not the breed that qualifies a bird as a prolific layer, yet I believe the White Leghorn, whether from more attention being paid to it from practical breeders in the past, will, in a series of tests, maintain the premier honours. It remains to be seen, however, when the prolific strains of the heavy breeds are more commonly kept whether the above statement will hold good.

Results Achieved by Victorian Poultry Farmers.

CAULFIELD POULTRY FARM.

The coloured plate opposite page 112 represents a portion of the Caulfield Poultry Farm. These poultry yards are laid out on the most modern and up-to-date lines, and may be described as complete in every detail. The yards, runs, houses &c., are constructed on convenient and labour-saving principles, and are neat in design as well as useful, but it is not in this direction that this farm has made a name for itself. The high standard of egg production of the poultry bred at these yards is the strong feature of its success. The breeds selected are White Leghorns and Silver Wyandottes.

White Leghorns.—In White Leghorns, the selection of stock was made from guaranteed laying strains obtained from American and Australasian breeders whose names were right to the front in the tests in the various States of the Commonwealth. Amongst the stock purchased were six hens, each with guaranteed records of 254 eggs for twelve months.



LEGHORNS IN THE ORCHARD.

The above is a view in the orchard of Messrs. T. H. Grant and Co., Pakenham. The poultry destroy the codlin moth and fertilize the land. When five months old, the pullets are graded into yards of twelve for egg production.

Every hen selected for the stud flock has a record of 200 or more eggs for twelve months. Male birds were also purchased from the very best laying strains, bred from hens with 200 or over record; type and general conformation were also considered in selecting the stock as it was the ambition of the proprietor, Mrs. A. J. Duncan, to breed typical birds, as well as high grade egg producers. The mating of these birds was on correct lines, and their stock have already provided undeniable evidence of their egg production as well as their show qualities.

Silver Wyandottes.—The excellent laying qualities of this variety are now recognised by the poultry keepers generally. In making a selection of stud birds, similar rules to the Leghorns were observed, laying qualities combined with type having been the essential requirements.

Hens with highest egg producing records have been purchased and the breeding pens are made up of high test birds. Amongst them is a pen of six hens that produced 207 eggs each in twelve months at the Government competition in South Australia, gaining the leading prize for the highest egg production in the heavy breeds. The whole of the breeding stock are from "200 or more" egg strains, and sisters to competition winners in Victoria and New South Wales. The male birds are also from noted laying strains, and judicious mating with unrelated hens is practised.

A proof of the laying qualities of the Silver Wyandottes bred at these yards, is here given. A pen of six hens, purchased for the Burnley School of Horticulture, produced an average of 180 eggs each for twelve months. The birds were not forced in any way, being kept for breeding purposes. When it is considered that they were second season hens, the average obtained must entitle them to be placed in the front rank as egg producers.

The balanced ration consists of pollard, bran, lucerne chaff, blood meal, green bone (freshly cut), wheat, heavy Algerian oats (tailed), and crushed maize.

Morning.—Pollard 2 parts, bran 1 part, lucerne chaff (steamed over night) 1 part. These are mixed together, and, when available, soup from meat scraps is added. The whole is given in a crumbly condition, about 3 ozs. per bird being allowed. Every other day during the laying season blood meal or green bone (½ oz. per bird) is mixed with the mash.

Midday.—Green stuff (chopped finely).

Evening.—Wheat and oats. In winter crushed maize is added. About 3 ozs. of grain per bird is considered a fair ration.

The yards are plentifully supplied with shell grit, gravel grit, and charcoal. Fresh water is provided by means of low-pressure taps which drip continuously throughout the day.

ORMOND POULTRY FARM, ORMOND.

UTILITY AND SHOW POINTS COMBINED.

During the past fifteen years, thousands of high class birds have been bred and distributed from the yards of Messrs. Rogen and Andrew at Caulfield. The whole of the buildings, runs, &c., are constructed on the latest and most up-to-date methods. The yards are under the supervision of Mr. G. E. Andrew, who is well versed in all matters connected with the industry. Before making a final choice of the best poultry to keep, he tried all the well known breeds, including Andalusians, Brahmas, Dorkings, Game, Hamburgs, Langshans, Leghorns, Orpingtons, Plymouth Rocks, and Wyandottes.

After tests extending over several years, he has decided that Silver Wyandottes, White Leghorns, White Wyandottes, and Plymouth Rocks, are the four best varieties to keep. In making this selection, he was influenced to a great extent by the egg production, and all round qualities of these breeds.

Wyandottes.—The Silver Wyandottes, without doubt, make up one of the best collections to be found in any part of the State. Besides being really good all round birds, they are excellent layers, and include many choice exhibition specimens.

The White Wyandottes are bred from specially selected American and Victorian laying strains, mated to produce birds which will combine egg production and table qualities to a marked extent. They are of the colour known as "stay white" and have already proved themselves to be a variety which can keep up its end as an all round fowl.

White Leghorns.—This premier egg-producing breed has found a place in the yards of Messrs. Rogen and Andrew, and the high opinion it has earned proves that it has "come to stay." Amongst the stock of this variety, is the pen of six birds which won the last egg-laying competition at Roseworthy, S.A. These six pullets produced 1,531 eggs in 12 months, averaging over 255 eggs per bird. Many other high test layers are included in the breeding stock.

Plymouth Rocks.—Plymouth Rocks have been recently added to the stock kept on this farm. The birds which formed the nucleus of the breeding pens were imported from America. They were selected from the very best laying strains in that country, where the Plymouth Rock is right on top as an egg producer as well as being a good all round bird.

The poultry on the farm at present numbers about 1,400 birds, 1,000 of them being young stock. Rigorous and close culling is practised to keep up the standard of the breeds. As an indication of Mr. Andrew's opinion of the value of the poultry industry, it may be mentioned that he has just added 75 new pens for laying stock. He holds the opinion that poultry keeping will, in the near future, be a very large source of revenue to our State.

In a subsequent issue of the *Journal*, Mr. Andrew purposes dealing fully with the successful methods of raising and feeding poultry practised by him at Ormond.

MODEL POULTRY FARM, BLACK ROCK.

(Particulars supplied by Mr. E. A. Noble.)

Average number of eggs laid by each pullet in twelve months	204
Average price realized, 1s. 1d. per dozen	18s. 5d.
Cost of food for each bird	8s.
Net profit for each bird	10s. 5d.

Breeds kept .. White, Silver, and Columbia Wyandottes, White Leghorns, Black and White Orpingtons, Barred and White Plymouth Rocks.

Morning Meal .. Bran, pollard, barley, oats, and rice meal, mixed with lucerne chaff steamed. Once weekly alternately, green bone and blood meal, mixed with foods.

Midday Meal .. Thousand-headed kale, silver beet, and green lucerne, cut finely.

Evening Meal .. Wheat, clipped oats, and crushed maize.

The quantity of food given to each bird is varied according to breed and appetite.

Particulars Supplied by Mr. A. N. Pearson, of the Halton Grange Poultry Farm, Lang Lang.

Description of Birds.	Date when Hatched.	Date when Commenced to Lay.	1907. August.	1907. September.	1907. October.	1907. November.	1907. December.	1908. January.	1908. February.	1908. March.	1908. April.	1908. May.	1908. June.	1908. July.	1908. August.	1908. September.	1908. October.	1908. November.	1908. December.	Totals for Four Months for Six Birds.
No. 1. Silver Wyandotte, stud birds	..	10.8.07	81	129	98	124	89	86	59	65	67	88	83	99	113	114	64	55	65	
,, 2. ,, ,, bred from No. 1 ..	9.12.07 and 24.1.08	15.6.08 and 30.7.08	..	..	..	..	..	..	..	..	..	..	9	32	90	*139	148	100	76	403
,, 3.} ,, ,, ,, ,, ..	1.1.08	3.7.08	..	..	..	..	..	..	..	..	..	..	..	23	117{	*133	132	109	115	489
,, 4.}																127	103	93	88	411
,, 5. ,, ,, ,, ,, ..	24.1.08	30.7.08	..	..	..	..	..	..	..	..	..	..	..	2	75	132	107	104	88	431
No. 6. White Leghorn, Wyckoff, Stud birds ..	..	..	..	..	..	131	100	96	66	34	10	0	0	23	59	84	121	102	98	
,, 7.} ,, ,, ,, bred from No. 6	9.12.07	16.5.08	..	..	..	..	..	..	..	..	..	9	50	47	74{	*120	149	137	135	541
,, 8.}																128	127	127	117	499
,, 9. ,, ,, ,, ,, ,,	1.1.08	4.6.08	..	..	..	..	..	..	..	..	..	..	25	75	102	131	132	121	115	499
,, 10. ,, ,, ,, ,, ,,	24.1.08	10.7.08	..	..	..	..	..	..	..	..	..	..	..	25	90	120	126	106	99	451
,, 11.} ,, ,, Sunnyhurst	9.12.07	14.5.08	..	..	..	..	..	..	..	..	..	18	62	77	100{	*140	144	135	105	524
,, 12.}																129	143	135	108	515
,, 13.} ,, ,, Caulfield Poultry Yards ..	9.12.07	19.5.08	..	..	..	..	..	..	..	..	..	12	65	66	97{	*132	161	143	133	569
,, 14.}																*125	152	134	125	536
,, 15.} ,, ,, ,, ,, ,, ..	1.1.08	7.6.08	..	..	..	..	..	..	..	..	..	..	15	61	71{	129	161	145	103	538
,, 16.}																121	136	121	108	486
,, 17. ,, ,, Padmans, stud birds ..	..	20.2.08	..	..	..	..	..	..	36	124	92	72	89	106	97	125	139	135	125	

* Selected for breeding.

The rations for adult fowls are as follow:—

(Per 100 birds.)

Morning Meal.—
- Pollard .. 6½ lbs.
- Bran .. 3½ ,,
- Lucerne chaff .. 3½ ,,
- Blood meal .. ¾ ,,
- Sheep's pluck .. One-half
- Soup .. 8½ pints

} Made into a dry crumbly mash

Mid-day Meal.—Chaffed green stuff, *ad lib.*

Evening Meal.—

		In Winter.	In Summer.
Wheat } Oats }	On alternate days	8 lbs.	9 lbs.
Maize ..	.. ..	1½ ,,	
Peas, crushed	.. ..	2½ ,,	3 ,,

CONCLUSION.

In conclusion, readers are reminded that poultry keeping should prove a valuable industry, and that there is every chance of success when it is combined with all or any of the industries enumerated elsewhere. There is practically an unlimited market in Great Britain for eggs and poultry and the prices are generally a good deal above the market values here. The price paid by exporters for turkeys, ducklings, and chickens is 6d. to 6½d. per lb. live weight, according to size. Victoria has a climate second to none for poultry breeding and there is ample room for the extension and development of poultry keeping on correct lines.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. All inquiries must be accompanied by the name and address of the writer.

CHEMICAL COMPOSITION OF MILK.—CURIOUS asks whether heifers give the best percentage of cream.

Answer.—The quantity of milk varies according to age and is greatest at third to fifth calving, but the chemical composition appears to remain unchanged through life, except at great age when the fats diminish.

SKIMMING SCALDED MILK.—AMATEUR wishes to know how long scalded milk set in milk dishes should remain before being skimmed.

Answer.—24 hours is ample. Scalding, by destroying Lactic Acid bacilli, delays souring, but does not prevent other changes which take place in milk so treated.

BOT FLIES.—H.J. states that his horses are worried with bot flies, although he is applying kerosene and phenyle daily. He inquires *re* treatment and also asks what are the symptoms when horses are affected internally.

Answer.—(1) The kerosene treatment may be assisted by tying a piece of cloth saturated in that substance under the jaw. Any method adopted depends for its success upon a frequent repetition. (2) There are no symptoms shown when an animal is affected. Occasionally, if the horse is in poor condition, intermittent colic is induced from indigestion, but the bot itself is not responsible for this nor does it cause death. In the natural course of the life history of the fly, the larvæ are passed away from the horse, and they may be assisted in the spring time of year by a drench of Linseed oil 1 pint, oil of Turpentine 1 oz.

MAMMITIS.—E.P. states that the udders of two of his heifers have become hard and the teats are choked with some fibrous matter. The teats are also inflamed and swollen.

Answer.—The condition of the heifers as described is "Mammitis." Hot fomentations three times a day should be persevered with, and after each, with plenty of gentle friction apply camphorated oil. In bad cases syringing out the udder with antiseptics and the application of belladonna ointment are beneficial.

CHRONIC INDIGESTION.—QUAIL SHOT states that one cow in a herd of twenty grazing on the same pasture is very subject to Hoven or Bloat. She is a good milker and appears to be in good health.

Answer.—This is apparently a case of chronic indigestion with resultant flatulence in an animal more disposed to it than others. Try the effect of daily administration of Bicarbonate of soda (Baking soda) in 2 oz. doses given in the damped feed or as a drench in 2 pints of water. Regulate the amount of feed as far as possible, especially that of a fermentable nature, such as lucerne, peas, &c.

ROUND WORMS.—D.M. inquires *re* treatment for horse affected with small red worms (about ½ an inch long).

Answer.—The small round worms are sometimes very difficult to eradicate. Put the horse on bran mash for 24 hours and then give 1 pint Linseed oil with 1 ounce oil of Turpentine as a drench. If evidence of worms still remains, try the effect of injecting into the rectum ½ gallon of lukewarm water in which is dissolved ½ ounce of common salt.

IMPACTION OF THE OMASUM.—W.G. wishes to know what is the cure for impaction of the omasum.

Answer.—Impaction of the omasum is a condition which seldom, if ever, is present in the cow. The normal condition of the organ is fairly dry and hard. For the digestive troubles which follow he feeding with dry impactious foodstuffs the administration of Epsom Salts 1 lb. in water 2 quarts, followed by powdered Nux Vomica 2 dr., Carbonate of Ammonia ½ oz., Ginger 1 oz., in water as a drench twice a day is useful.

EXCESSIVE APPLICATION OF BLUESTONE.—M.W.M. states that about three months ago a draught mare developed a lump on the fleshy part of the cheek. Since breaking, he has daily applied Bluestone and after treatment matter resembling clots of blood comes away.

Answer.—The continuous application of Bluestone is keeping the wound sore and discharging—the substance is a caustic and so destroys the tissues. Washing the sore daily with a 1 in 2,000 solution of Perchloride of Mercury and then dusting dry Boracic Acid Powder on will be more useful.

INJURY TO JAW-BONE.—J.B.F. writes:—"Three months ago a yearling filly of mine got the side of its lip torn by a hook, which also chafed the bone. The lip was stitched and the wound apparently healed, but a lump remains on the bone, causing the side of lip to protrude. Would you recommend a blister?"

Answer.—The swelling on the bone has been induced by the injury, and it is doubtful if you will ever get it away completely, though in time it will become greatly reduced. It would not be wise to apply a blister but absorption may be stimulated by painting three times a week with a strong tincture of Iodine.

STAMPING AND BITING OF FETLOCKS BY MARE.—J.T.W. states that a mare belonging to him is constantly stamping and biting her fetlocks.

Answer.—Give 1 oz. of Epsom salts in her feed night and morning for about 2 weeks. Cleanse the parts thoroughly and rub well into the roots of the hair daily a mixture of equal parts of Methylated Spirits and Castor Oil.

REMOVAL OF WARTS.—R.R. asks what is the best way to remove warts on a cow's teats.

Answer.—Large warts may be removed by tying a piece of waxed silk around their base. In a few days they will drop off. Smaller ones may be painted with Lunar Caustic, but as any treatment is liable to make the teats sore the cow should not be treated until dry.

LUMP ON HORSE'S SHOULDER.—J.McP. asks what blister is recommended for removing lumps on the shoulders of a horse. A lump, about the size of a hen's egg, has formed on each shoulder, and when the horse is spelled the swelling goes down somewhat, but the lumps can always be felt?

Answer.—Red blister may be used if the horse can have a good spell after applying it. Should the swelling increase, as the result of such blister, it will be necessary to operate, which, in most cases, is the most satisfactory treatment, the swelling being a small shoulder tumour, due to pinching or jarring by the collar.

COW PEAS.—J.B. asks whether he could sow maize and cow peas in the same drill?

Answer.—It is not desirable to sow maize and cow peas in the same drill. The cow pea is a shrub, and not a vine, and hence would not climb up the maize stalk.

MAIZE SILAGE.—J.B. finds that maize silage alone does not increase the flow of milk to any extent, although it keeps the stock in good condition.

Answer.—Maize silage alone does not contain a sufficient proportion of the flesh forming constituents of food to increase the milk flow when fed by itself. The additions necessary to supplement it may be made with lucerne hay, good oaten or wheaten hay chaff, bran, or crushed oats, or peas.

PLOUGHING NEW LAND.—M.S.R. inquires as to best plough to use for breaking up hard ground for the first time. Disc ploughs are not much used in his district?

Answer.—Disc ploughs are thoroughly suitable for the first ploughing of stiff land. After lying in fallow for some months, the land should be reploughed with an ordinary 2 or 3 furrow plough, and well worked down with roller, disc, and harrows.

INDENTIFICATION OF PLANTS.—V.W. forwards specimen of plant for identification.

Answer.—It is Meadow Fescue (*Festuca elatior*, L.), a native of Europe, now naturalized in this State. It is an admirable fodder grass for land that is not too dry, and does well under irrigation. Its yield is good, though not quite so high as for Timothy, Foxtail, or Rye grass. It is better suited for cattle and horses than for sheep, for which the Sheep's Fescue (*Festuca ovina*, L.), is a better grass.

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THE ALGARROBO OR CAROB TREE.

F. de Castella, Government Viticulturist.

This valuable tree is not unknown in Victoria, for healthy specimens are to be found here and there in several of our country districts and its extensive cultivation has been recommended by Baron von Mueller and other botanical authorities. This advice has not, however, been acted upon and no trials on anything like a practical scale seem to have been made.

A few notes concerning what I saw recently of this remarkable drought resisting tree in Eastern Spain may prove of interest, and possibly lead to its further trial in Victoria.

CAROB TREES IN EASTERN SPAIN.

It was on the railway journey from Barcelona to Valencia that I first saw extensive plantations of it; in this region the Algarrobo is one of the striking features of the landscape. The beans borne by it, and especially the fleshy pods rich in sugar in which they are contained, constitute a large portion of the fodder consumed by horses and mules. So much is this so

that in most villages of Eastern Spain the fact that a stable is attached to a house is usually revealed by the penetrating smell of the bean pods, which, roughly chaffed, almost always form part of a horse's ration. Considerable quantities are also shipped to England and other countries.

The Levante, as the East Coast of Spain is usually termed, appears to be the natural home of this remarkable tree in the Peninsula. North of Barcelona the climate is rather cold for it but south of that town right down to Alicante, Algarrobals, as plantations of this tree are termed, meet the eye everywhere. It is rarely planted on good land. Its deep roots and power of resisting drought render it capable of living where scarcely anything else will, and these qualities are taken advantage of in order to utilize land which would otherwise be almost valueless and which is too dry for the vine and the olive. Right up among barren rocks, wherever one can find a few feet of soil and sometimes even where this is practically absent but where the rock is sufficiently fissured for its deep roots to penetrate, can one see the handsome, dark green, ash-like foliage of the Algarrobo.

Botanically known as *Ceratonia Siliqua* and popularly, in English, as the Carob or Locust bean and sometimes, but it appears erroneously, as St. John's Bread, it belongs to the order of leguminous plants and is a handsome tree, frequently attaining a height of 50 feet. Its longevity is phenomenal; most of the trees in the Levante are several hundred years old. Like the olive it assumes, with age, most curious shapes; sometimes the central portion of the trunk decays away, so that one tree is split up into two or three. Frequently one sees a very old tree with the base of its trunk built around to a height of 5 feet and even more, with big limestone boulders from the hillsides; propped up so to speak but continuing nevertheless to yield its crop of beans.

The Algarrobo is diœcious, male and female flowers being borne by separate trees. Seedling plants must therefore be grafted, only a few males being retained for the supply of pollen. The female trees, of course, alone produce beans. Several distinct varieties are known. Plants of two of the most popular, known respectively as Rogeta and Negreta were recently imported by this Department so scions for grafting will ere long be available.

Though capable of living and bearing its beans under the most unfavorable circumstances this tree, like most others, responds to good treatment and regular plantations are almost always cultivated whenever the nature of the land permits the use of a plough. Even when this is not possible the trees are usually dug round. Near Jaraco, on the railway journey between Gandia and Carcagente, I was struck by one plantation the soil of which consisted solely of fairly large stones—not gravel. The regular lines in which they were arranged left no doubt as to ploughing having been duly executed.

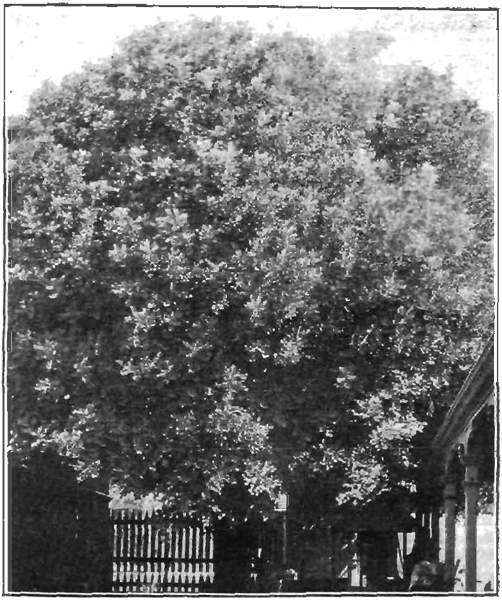
A few figures as to expenses of cultivation and yields may prove of interest. For these I am indebted to Don Rafael Janini y Janini who quotes them from D. G. Lleo Comin, Engineer-in-Chief of the Spanish *Forestry Department.*

The trees are planted very far apart; 24 trees per hectare or about 10 trees per acre is the usual number. At 10 or 12 years old they produce 84 lbs. of beans per tree and at 40 to 45 years they are in full bearing, the usual crop of beans being about half a ton per acre. Cost of cultivation

per acre is estimated to be as follows, reduced to English money and reckoning the peseta at par:—

	Usual cultivation. s. d.	More generous treatment s. d.
Ploughing	9 7	14 0
Scarifying	—	1 11
Pruning (paid for by value of firewood obtained) ..	—	—
Gathering and cartage	3 10	5 2
	13 5	21 1

The market value of the beans in 1906 was 2 to 2.15 pesetas per arroba of 12.78 kilos, equivalent to from £6 3s. to £6 12s. per ton.



CAROB TREE AT SWAN HILL.

The fodder value of the beans is high. They contain, according to Baron von Mueller, 66 per cent. of sugar and gum; this authority instances a tree having yielded nearly half a ton of pods in a season. Such a tree must have been grown on rich soil and not on the poor dry land, fit for nothing else, which it is usually the fate of this generous tree to be planted in.

Two statements made in Spain in connexion with the Carob tree deserve considering here—one is that it will not do inland; that it must have the sea air in order to thrive. The other is that it must only be planted in limey soils. The limited experience we have of the tree seems to contradict both these contentions so far as Victoria is concerned. Several fine trees exist in our inland climate, notably at Bendigo, Dookie, and Mildura; some of these are in soil very poor in lime and bear abundantly, though only locally raised seedlings and therefore not of the best varieties.

The theory that the Algarrobo must feel the sea breeze probably arises from the nature of the country in Eastern Spain. As one leaves the coast and goes inland the rise above sea level is very rapid and the climate becomes too cold for the tree to thrive. Strange to say I did not notice it growing anywhere in Andalucia (Southern Spain), though there does not appear to be any reason why it could not be successfully grown there.

Photographs of Algarrobos near Denia and near Gandia are here reproduced, and also of one at Swan Hill, in Victoria. The latter was 38 years old when photographed; the height was then 27 feet and the girth, 2 feet from the ground, 5 ft. 3 in.

THE DAIRY BULL.

J. S. McFadzean, Dairy Supervisor.

The statement "the bull is half the herd" is often made; and it is a statement that indicates a fair and proper estimate when dealing with pure-bred stock. With grade stock, however, the bull has anywhere from three-fourths to everything to do with what that herd will be a few years hence. Where haphazard breeding has previously been practised, the introduction to the herd of a pure-bred bull of milking pedigree will most surely result in increasing the profit from that herd. The man who persists in endeavouring to make a living by dairy-farming with mongrel stock is "hoeing a hard row." To be successful at anything calls for as much reasoning and common-sense method as it is possible to command. To succeed at dairy-farming no branch of it should be neglected.

The first proposition in dairying is the obtaining of suitable cows. Every buyer knows that good cows are scarce. Almost all beginners know to their cost how few cows prove satisfactory out of the number purchased, and also that the buying price of such good ones as they are lucky enough to get hold of is invariably high. Good dairy stock are raised by dairymen and from dairy stock only. Usually every dairyman keeps the best he breeds for his own herd. It is therefore obvious that really good cows are seldom obtainable at a reasonable price. In fact, except at clearing sales, only poor and medium dairy stock are usually obtainable except at high figures. The shrewd dairy-farmer therefore breeds his own good milking stock, and sells his culls; for, if he depends on the market for good cows he will pay the full value for the bulk of his purchases, and handle much inferior stock at a loss meanwhile. The breeding of high-class dairy stock is profitable work, for there is, and must always be, a steady demand for first-class milkers.

Among Victorian dairy-farmers there are many who possess highly remunerative studs of pure-bred dairy stock. Every progressive dairyman

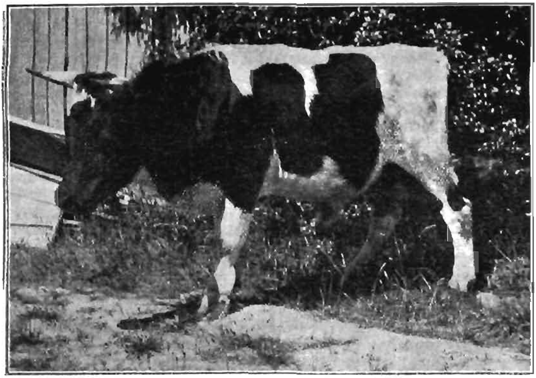
now recognises the value of pure-bred stock with a milking pedigree, and many find it more profitable to raise their own bulls for breeding stock than to buy them as required. The former method unquestionably opens up more opportunities for improvement, but every one is not gifted with a faculty for stock-breeding, and many have not the inclination. Breeders of high-class dairy stock are, however, sufficiently numerous in Victoria to allow of every dairyman obtaining a pure-bred bull at a reasonable figure to improve the quality of his milking herd. This being so, it is regrettable to note that the use of mongrel bulls and bulls of inferior breeding is causing the dairying industry of this State thousands of pounds' worth of loss annually.

The persistent intermixing of the various breeds and grades of cattle in many dairy herds is probably the result of the old-time teaching that cross-bred stock were hardier than those pure bred. The error in this arises from the fact that pure-bred stock were handled much differently years ago than they are now; but the old-time ideas still live. Dairy stock are not now pampered and forced for the show-ring. The judges do not look for it. The pure-bred show stock of the present day are strong, hardy animals, that for the most part of the year are treated the same as the rest of the dairy stock, with a little extra feeding and grooming as show day approaches. At the shows the prize-takers are strong, robust cattle, and continuous breeding from sound-constitutioned stock has given us pure-bred animals as hardy as can be desired. The milking capabilities of the present-day pure-bred dairy stock is also beyond question. Occasionally a cross-bred or grade animal is found that is an extra heavy producer. That this is not due to the actual crossing is demonstrated by the variability shown in cross-bred animals as compared with pure stock. Such dairying qualities as occur in cross-bred cows are due to the influence of some pure-bred stock from which they have sprung, and which the effect of crossing has failed to annul. It is amongst pure-bred stock that consistent milk production and evenness of quality generally are most in evidence; and the proportion of deep milkers amongst pure-bred stock is considerably greater than amongst crossbreds. Even if it were possible to consistently obtain good milking stock from first crosses, the maintenance of pure herds is essential to the continued production of first crosses; and the keeping of pure-bred animals to breed first cross stock is very like taking one step forward and slipping back two. The crossing of pure breeds of dairy cattle to produce milking stock has, therefore, nothing to recommend it.

With two such profitable milking breeds of cattle as the Jersey and Ayrshire in large numbers in the State, there is no reasonable excuse for any dairyman using a cross-bred bull. Both of these breeds are long established, and have been developed by breeders solely for dairy work. On this account, bulls of these breeds stand far before those of any other class of stock at present in the State in their suitability for improving ordinary farm herds from a dairying stand-point. The longer a breed is established the more fixed are its characteristics, and the more prepotent may we expect the males to be in stamping their good qualities on their progeny. When, therefore, a stock-owner wishes to improve his cattle for dairy work the use of a pure-bred bull from dairying stock is an absolute necessity. To endeavour to attain the desired end with a cross-bred animal will inevitably result in failure: and it is significant that it is from the users of inferior breeding stock that we invariably hear the complaint that "dairying does not pay."

Very noticeable, indeed, is the deterioration which results from the use of an inferior bull in those cases where the farmer has succeeded in getting together a herd of fairly good well-bred cows. If the bull used is not from pure-bred dairy stock, the heifers from these cows are invariably inferior to their mothers, both in type and milk production. As, however, three to four years must necessarily elapse before the progeny of such a mating show their want of quality as milkers, even if the error is then corrected, the dairyman has practically wasted those years by allowing his herd to deteriorate when he might have been improving it.

Almost on a par with the user of the cross-bred bull is the dairyman who, while using pure-bred bulls, varies the breed he uses from time to time, and thus consistently "mongrelizes" his heifers. The whole intent of using pure-bred bulls is to strengthen and perpetuate the dairying qualities of the herd by the repeated addition of pure blood to it from

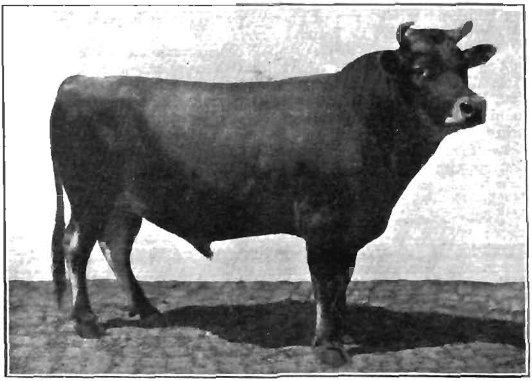


RESULT OF CROSS BREEDING.

one reliable breed. By this means the grade of the herd is raised in each generation of heifers, till in time it should become almost indistinguishable from a pure-bred herd. The only reason for advocating this grading up of a herd instead of starting with pure-bred cows right from the outset is that it is less expensive. It is, therefore, the more capable of being carried to a successful issue by the man of small capital. Very few dairymen can at the start buy pure-bred stock solely. The alternative is for each to make the best of such cows as can be obtained. This can only be done by following on the lines of pure breeding. Where an occasional cow or heifer of good dairying quality and of the same breed as the bull that is used can be added to the herd, improvement will be so much the quicker; but in any case satisfactory progress can be depended on by adopting the grading-up process. If, however, a change is made in the breed of the bulls used, exactly the same result will be obtained in the progeny of the second animal as if a cross-bred bull had been used in the first instance.

The only variation is that the deteriorating effect is postponed until the progeny of the second bull matures. In such a case it is almost a certainty that the breeding of this second bull would be blamed for any such deterioration; whereas the whole trouble would be in the mongrelizing result which had thus thoughtlessly been brought about by the owner.

Breeders of stock recognise several laws which apply to all animals. Among these are the laws of "heredity" and "atavism." The former is explained to a certain extent by the phrase "like begets like." This law is reliable only when dealing with pure-bred stock of known breeding and fixed traits of character. By atavism, on the other hand, is meant a reversion to the type of some more or less remote ancestor. The occurrence is commonly known as "throwing back." The result is the revival of some tendency which had previously been eliminated by persistently breeding against it. All domestic animals have their origin in some wild species. Through many generations past breeders of cattle



RESULT OF JUDICIOUS MATING.

have culled out animals that showed undesirable characteristics, and bred only from such as possessed those which it was sought to perpetuate. In this way the various breeds have been formed and perfected, but behind them all lies their wild ancestry. If stock are permitted to breed indiscriminately they tend to revert towards their original types with amazing rapidity; thus showing the potency of this power of "atavism" or "throwing back"; or, in other words, the strength of the blood of the original species. Where a breed has been kept pure for a long period the tendency to atavism is held in check. One object, therefore, of maintaining and intensifying purity of breeding in dairy stock is to prevent reversion or throwing back to an undesirable type.

The dairy-farmer, therefore, who uses any other than a pure-bred dairy bull is working backwards from year to year; and, in the end, he must either give up dairying or begin over again by buying fresh stock. On

the other hand, the user of the pure-bred bull each year improves the grade of his herd in both appearance and production, and establishes his business on a sound paying basis. While he is thus yearly increasing the profit from his herd, such animals as he finds it expedient to cull out will find a more ready sale on account of their showing some indication of having been bred from dairy stock; and the nearer his grades approach in character to the pure stock the better will his selling prices be. In the improved prices of culls alone the purchase of a good bull is often repaid.

It cannot be too strongly emphasized that the use of an inferior bull in the dairy herd is a death-blow to the success of the next generation of the herd. Valuable time is being wasted and money lost on every dairy farm where the owner neglects to make use of that most economical and sure aid towards increasing his profits—the pure dairy-bred bull.

On pages 134 and 135 respectively are shown two opposite results in stock breeding. The one on page 134 is a degenerate specimen, the result of mating a cross-bred bull to a cross-bred cow. He is a 3-year-old bull, and at the price of grass alone the raiser is probably some £4 to £5 out of pocket by keeping him.

On the other hand, the Jersey bull demonstrates the result of judicious mating. He is a winner of considerable prize money and, being bred from dairy stock, he is highly valuable as a dairy stud bull; in addition, his owner has an animal whose appearance is a considerable pleasure to him. This bull is at present 25 months old, and has won 10 first prizes and 4 championships. He was placed second in the yearling class of 21 entries at the Melbourne Royal Show, 1907. That was his first appearance in the show ring, he being then 10 months old. Since then he has not been beaten in his class, winning in succession at Bacchus Marsh, Cranbourne, and Dandenong in 1907; Lang Lang, Frankston, Melbourne Royal, Ballarat National, Bacchus Marsh, and Dandenong, 1908; and he opened this year by winning first and champion prizes at Frankston in January. These particulars were kindly furnished by the owner, Mr. Wm. Ayres, who has a small dairy herd at Railway Avenue, Malvern. Mr. Ayres has been breeding Jerseys for some 12 years past, and his first exhibit—a cow—won 1st and champion prizes at Bacchus Marsh in October, 1901. That cow was Daphne, the grand-dam of this bull, Favourite's Fox II. His breeding is as follows:—

Favourite's Fox II.	Favourite's Fox.	Carnation's Fox (imp.).
		Favourite III. by Belteshazzar (imp.).
	Pretty's Queen.	Pretty's Boy.
		Daphne.

EXPERIMENTAL WHEAT FIELDS, 1908-9.

REPORT ON THE SEVEN-YEAR FIELDS.

F. E. Lee, Agricultural Superintendent.

The present report deals with the results of the fourth year's crops upon the experimental wheat fields conducted under agreement with the Department for a term of 7 years. The endeavour has been made from year to year to investigate soil problems under practical conditions, and at the same time to afford the owner of the land an opportunity to test the suitability of a number of selected wheat varieties under local conditions of soil and climate. In the carrying out of this policy the inspecting officers have been able to familiarize themselves with the methods and prejudices of the wheat-grower throughout the north. As the result of the mutual exchange of ideas, I have formed the opinion that a great number of wheat-growers do not give the necessary attention they should to seed selection, nor does there appear to be much attempt made towards differential cultivation in soils of widely dissimilar character.

These facts are stated not in any disparaging spirit, but simply because they seem to be logical reasons why the average yield of wheat in Victoria remains stationary. The want of uniformity in the character of many of the soils in northern Victoria largely increases the difficulty of recommending any specific course of soil treatment which would meet all cases. It must be patent, however, to any observer that the red clay soils throughout the Wimmera differ widely from the black friable loams and sandy soils; this difference is not only in texture but in plant food constituents as well. The moisture holding capacity of each type of soil also varies considerably. To illustrate the necessity for a different method of cultivation to suit each class of soil, where such is in sufficiently large areas, the following samples were selected in the Echuca district, representing fairly extensive areas of each type. The samples are surface soils only.

SOIL ANALYSES, ECHUCA DISTRICT.

Class of Soil.	Chemical Analysis.					Mechanical Analysis.			
	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Chlorine.	Gravel.	Sand.	Clay.	Organic Matter.
	%	%	%	%	%	%	%	%	%
Sandy	.036	.012	.104	.148	.008	.54	89.66	8.10	1.12
Sandy loam	.142	.054	.250	.304	.008	.05	62.60	30.44	4.85
Loam	.075	.078	.319	.202	.003	.65	46.85	46.80	2.96
Clay loam	.179	.060	.348	.484	.003	.25	25.70	63.72	6.07
Clay	.122	.074	.510	.242	.010	.75	15.80	66.69	7.02

It is not difficult to understand that soils of the sandy, sandy loam, and loam types, containing from 46 to nearly 90 per cent. of sand, are not only easy to work but are also easy to preserve in that loose surface condition whereby the loss of moisture is checked. The clay loam and clay types, which constitute such a large portion of the Wimmera and northern plain country, on the other hand, are made up of much finer particles. After rain, these soils run together and bake easily; hence they require to be cultivated at a different time or in a different manner to those containing a greater proportion of sand. Clay soils are no less well furnished in the elements of plant food, but their physical condition or texture prevents them in many cases from producing maximum results. It may also be said that clay soils

are slow to absorb moisture; hence it often happens that wheat sown on stiff land is drowned out by water lying on the surface during the winter. Deeper cultivation, as is the case in subsoiling, facilitates the passage of moisture into the subsoil, and there is reason to believe from the evidence of these fields that this system has certain advantages in altering the texture of the soil. Something of the same nature can be effected by the growth of deeply rooted plants, such as rape, peas, &c. It would be worth any farmer's while to carry out a variety of experiments in cultivation methods on the stiff clay soils on his farm in order to arrive at a better understanding of the behaviour under certain conditions.

I hold the opinion that the most that can be expected from these fields is a suggestion towards improvement in any direction. It necessitates a wider sphere and greater variety of conditions to test the utility of any alteration in cultural methods before a final conclusion can be come to. Farmers are somewhat cautious in adopting changes of method, but there seems to me sufficient logic in the chemical and mechanical analyses quoted from a typical wheat-growing district, to make it worth while the attention of some large wheat-grower, who has soil of a stiff clayey character, to approach the question of an alteration in soil treatment as a possible and probable means towards increased production of grain.

ORDINARY CULTIVATION *versus* SUBSOILING FOR HAY.

One of the dangers attendant on constant cropping with wheat only, is the introduction of "take-all." To minimize this possibility and at the same time to afford the soil an opportunity to recuperate its store of nitrogen, a crop of Algerian oats and field peas was sown on Section A (ordinary cultivation) and Section B (subsoiled). The results below indicate that for hay growing in the Mallee, Wimmera, and Northern Plains the subsoiling has been of negative value. It was pointed out in a report on these same fields in the March, 1907, *Journal*, that as regards increase in the yield of grain, the subsoiling was beneficial in the Northern Plain country only.

YIELD PER ACRE OF ALGERIAN OATS AND PEA VINE HAY.

Mallee and Fringe.		Wimmera.		Northern and North-Eastern Plains.	
Ordinary Cultivation.	Subsoiled.	Ordinary Cultivation.	Subsoiled.	Ordinary Cultivation.	Subsoiled.
tons.	tons.	tons.	tons.	tons.	tons.
1.5	1.6	1.8	1.9	1.5	1.5

It will be noted that of the fields representing the Mallee and fringe no less than 7 out of 12 show an increased yield on the subsoiled land; in 4 cases the yields are identical, and in only one is the yield superior on the land cultivated in the ordinary manner. In the Wimmera, the effect of the deeper cultivation has been responsible for an increased yield in 2 cases out of 5. In the Northern Plains the balance of fields is in favour of the ordinary cultivation, although there is practically little difference between the yields of hay under both methods.

RETURNS OF VARIETIES, SEASON 1908.

Some allowance must be made for the poor returns of Bunyip and Comeback, both of which were on the outside edges of the fields, and both being early varieties received more attention from the sparrows than the varieties in the centre.

RETURNS FROM THE SEVEN-YEAR WHEAT EXPERIMENTAL FIELDS, 1908-9.

Experimenter.	SECTION A.	SECTION B.	SECTION D.									
	Yield per Acre.	Yield per Acre.	Bunyip. 1.	Federation. 2.	Jade. 3.	College Purple. 4.	Yandilla King. 5.	Dart's Imperial. 6.	Marshall's No. 3. 7.	Jumbuck. 8.	Wallace. 9.	Comeback. 10.
	tons.	tons.	bshls.	bshls.	bshls.	bshls.	bshls.	bshls.	bshls.	bshls.	bshls.	bshls.
MALLEE AND FRINGE.												
Boyd, A., Minyip ..	.9	.9	22.3	26.2	25.8	26.2	21.2	24.5	22.0	25.6	26.8	23.4
Bennett, J., Warracknabeal	1.5	1.8	7.7	21.3	15.6	17.0	9.5	8.4	7.5	14.0	12.5	11.7
Milbourne, J., Warracknabeal ..	2.1	2.5	7.5	12.5	15.2	14.2	15.0	15.6	9.3	20.7	20.6	13.1
Witney, J., Jeparit ..	2.2	2.1	15.1	16.6	17.5	3.7	3.2	3.1	3.1	3.2	3.7	2.8
Allen, J., Willenabrina	1.4	1.5	1.0	10.1	8.2	7.5	5.8	6.3	4.1	4.1	3.4	1.8
Innis, J., Rainbow ..	2.5	2.5	12.5	21.6	15.0	10.0	9.2	12.8	7.3	14.8	10.6	12.5
Pilgrim, J., Nhill ..	.9	1.0	14.6	31.4	25.6	27.2	29.2	28.1	22.2	26.3	28.4	20.1
Lavery, B., Watchem	2.0	2.5	16.9	22.5	18.2	21.5	24.2	25.5	19.8	22.7	17.5	18.7
Barber, A., Wycheproof	1.7	2.1	7.9	26.6	21.8	19.5	19.5	20.2	15.5	15.5	15.2	15.2
Mudge, J., Sea Lake	.6	.9	4.0	9.0	6.1	5.4	4.5	6.0	3.1	4.4	4.1	6.6
Pollard, H., Glenloth	.8	.8	3.8	6.1	3.9	6.9	8.0	6.5	2.7	5.5	3.6	3.7
Williamson, W., Boort	1.3	1.3	9.6	15.1	13.1	14.0	17.3	15.0	11.2	9.1	6.7	6.7
Average of 12 fields ..	1.5	1.6	10.2	18.2	15.5	14.4	13.8	14.3	10.6	13.8	12.7	11.3
WIMMERA DISTRICT.												
Hutchings, A., Lubeck	1.6	2.2	9.5	16.7	16.1	16.6	10.6	13.4	13.7	20.7	20.5	7.5
Tepper, Mrs. P., Coromby	1.8	2.2	11.2	9.7	12.8	12.3	11.2	12.6	11.6	13.3	12.0	7.6
Nowatna, C., Jung ..	2.1	2.0	27.5	36.6	32.8	34.5	42.1	37.5	32.8	29.9	28.3	26.1
Longerenong Agricultural College ..	Cut for	ensilage	17.9	14.5	13.9	15.0	12.3		Cut	for	hay	
Gibbins, E., Wail ..	2.3	1.9	17.2	23.7	19.8	14.5	15.0	15.0	6.8	23.4	22.5	14.3
Feery, J., Dimboola	1.6	1.6	13.9	17.2	17.5	12.5	11.9	11.8	5.0	8.2	6.5	4.6
Average of 6 fields ..	1.8	1.9	16.2	19.7	18.4	17.5	17.1	18.0	13.9	19.1	17.9	12.0
NORTH AND NORTH-EASTERN PLAINS.												
Howard, J., Bet Bet	1.4	2.0	14.0	17.7	18.2	19.4	15.6	13.5	7.3	13.6	8.7	9.3
Nixon Bros., Eddington	1.8	1.6	18.3	23.3	20.0	23.3	17.8	17.5	22.5	21.1	23.8	12.4
Sproat, W., Donald ..	1.7	1.5	23.7	27.9	24.2	24.5	19.4	20.0	19.5	20.4	17.6	21.0
Carter, J., Marong ..	Weights	not kept	22.3	20.5	26.2	19.6	21.7	21.0	23.0	22.3	21.5	19.3
Trewick, J., Elmore	1.6	1.6	10.0	16.5	15.6	15.8	17.9	18.3	17.4	16.4	14.4	14.0
Bray, W., Merrigum ..	Cut for	ensilage	4.6	9.6	12.0	13.0	9.4	7.8	8.0	8.8	4.7	11.3
Sharp, T. R., Goorambat	2.2	1.8	Cut	for	hay	10.2	8.2	11.5	12.1	12.4	12.5	10.1
Hunter, R., Elmore ..	.8	.8	3.2	5.1	4.4	5.9	2.9	2.9	3.1	3.6	3.3	3.3
Average of 8 fields ..	1.5	1.5	16.0	17.2	17.2	16.4	14.1	14.0	14.1	14.8	18.3	12.6
Average of 26 fields ..	1.6	1.6	12.6	18.3	16.7	15.7	14.7	14.9	12.4	15.2	13.9	11.8

YIELDS OF WHEAT VARIETIES.

The most prominent feature in the conduct of the experimental fields under review has been the introduction of wheat varieties which have shown themselves prolific yielders in other States. Altogether, over 50 new wheats have been introduced since the inauguration of the experiment in 1904. The comparisons have been most rigorous, and only the fittest have survived. It is unreasonable to expect any one variety to surpass all others

over a wide range of soils and varying climatic conditions, but yet the Federation seems to have achieved this success. Federation, strongly advocated by the Department, has been grown each season for four years against the Dart's Imperial, which is generally accepted as being the variety most extensively grown by the wheat farmer in Northern Victoria. The following comparison is interesting:—

Season.	Federation.			Dart's Imperial.		
	Mallee.	Wimmera.	North Plains.	Mallee.	Wimmera.	North Plains.
	bushels.	bushels.	bushels.	bushels.	bushels.	bushels.
1905 ..	14.7	21.3	22.4	14.5	21.1	20.6
1906 ..	19.0	30.0	27.8	15.1	26.9	22.3
1907 ..	14.6	18.5	17.0	14.0	13.5	14.2
1908 ..	18.2	19.7	17.2	14.3	18.0	14.0
Average ..	16.6	22.3	21.1	14.4	20.3	17.7

The above return clearly illustrates the superiority of Federation over Dart's Imperial by an average of 2 to 3 bushels per acre for a term of four years. Estimating 2,000,000 acres as the average cut for grain each year, an additional 5,000,000 bushels of wheat at 3s. per bushel net would mean £750,000 distributed amongst the wheat-growers. It is doubtful if any more valuable comparison has previously been made in Victoria between the capabilities of two wheats. The Field Branch is justly proud of having been the means of distributing Federation wheat, which fact alone has already compensated the State many times over for the expense incurred in the conduct of these fields.

CONCLUSION.

It is proposed to further prosecute the testing of new wheats during the coming season. The Federation will be accepted as the standard and all varieties not coming within measurable distance as regards yielding qualities will be discarded. The portions of the field under crop during 1908 will be fallowed and maintained in good order for further cropping in 1910. It is also proposed to submit samples of the wheat grown upon the experimental fields to a milling test, as soon as the plant is in working order. Subsequently, the milling qualities of all varieties will be made public, and the wheat grower encouraged to persevere only with those of a high grade as regards flour production.

The Field Branch acknowledges the assistance and courtesy shown during the whole term of the experiment by those concerned.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page 85.*)

XVIII.—The Ductless Glands.

So far as our present knowledge is concerned the most unsatisfactory chapter in physiology is that dealing with those organs which have been termed the ductless glands. As the name implies these structures are devoid of any visible efferent channel carrying a secretion. In the case of some of them it is indeed doubtful if any secretion is formed at all, in which case the term "gland" is wrongly used. As regards the functions of the ductless glands we know next to nothing. That they play a most important part in the economy of the body has been proved beyond doubt by pathological evidence and in the case of some of them by the disastrous results that follow their removal.

LYMPHATIC GLANDS.—In the chapter on the circulation it was shown that the living cells of the body are bathed in lymph, which fluid can be regarded as a filtrate that has oozed through the thin walls of the blood capillaries. The spaces between the body cells are filled with lymph and these spaces open into minute vessels, the lymphatic capillaries, which convey the lymph into larger lymphatic vessels and so on until the whole lymph stream is discharged back again into the blood. The flow of lymph is very sluggish and, in the case of the limbs, is practically absent unless the limb be moved or massaged, in which case the lymph is worked along the vessels owing to the rich supply of valves with which these are supplied. But before the lymph is allowed to re-enter the blood it is obliged to pass through at least one lymphatic gland. The lymphatic glands are masses of lymphoid or adenoid tissue, a structure composed of a very open frame-work loaded with round white cells which are remarkably like some of the white cells of the blood. The lymphatic vessel as it enters the gland breaks up into a number of finer vessels and the lymph thereby is brought into intimate contact with the cells of the gland. It is highly probable that here we have a protective mechanism by which toxins, or the bacteria themselves, are destroyed. If, for instance, inflammation occurs in a limb the lymphatic glands (such as those in the human groin), through which the lymph draining the infected area passes, swell up and become painful. If the toxins be in excessive amount they may be able to run the gauntlet of the glands successfully and so enter the circulation producing profound constitutional disturbances. Malignant tumours are very liable to spread along the lymphatic vessels and infect the glands often fairly remote from the original seat of mischief.

In the alimentary canal we find masses of lymphoid tissue placed superficially in the mucous membrane. These belong to a slightly different category from the lymphatic glands proper because they are not situated in the course of a lymph stream; but the tissue of which they are composed is practically identical with that in the lymphatic glands. At the back of the mouth on each side and guarding the entrance to the pharynx we have the tonsils and in the upper part of the pharynx itself a ring of lymphoid tissue is found which, when swollen, constitutes the well known *adenoids*. In the small intestine the lymphoid masses

are known as Peyer's patches. Then in connexion with the cœcum there is a definite mass of this tissue which in some animals (as in man) is so pronounced as to constitute a distinct organ, the vermiform appendix. Of the functions performed by these lymphoid organs we know nothing. The only surmise possible is that they act antagonistically to invading disease germs, but it must be admitted that they are themselves singularly liable to bacterial aggression; thus, as in the human being, the tonsil is attacked by scarlatina and quinsy, Peyer's patches by typhoid, and the appendix by various inflammatory processes.

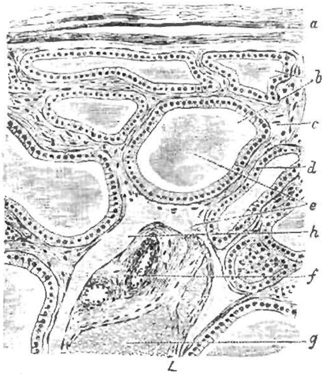


Fig. 64.—Part of a section of the human thyroid—*a*, fibrous capsule; *b*, thyroid vesicles filled with, *e*, colloid substance; *c*, supporting fibrous tissue; *d*, short columnar cells lining vesicles; *f*, arteries; *g*, veins filled with blood; *h*, lymphatic vessels filled with colloid substances. (After S. K. Alcock.)

THE SPLEEN.—This organ, present in all true vertebrates, is composed of a tissue closely resembling lymphoid tissue. It is well supplied with blood vessels and its cells come into closer contact with blood than those of almost any organ of the body, as lymph spaces are practically absent. The blood circulating through it passes eventually into the portal vein and so must traverse the liver before reaching the general circulation. It has been supposed that the function of the spleen is to pick out of the blood the red corpuscles that are the worse for wear and to destroy them, but the evidence on which this view is based is not convincing. Some have supposed the spleen to be the seat of formation of white blood corpuscles but this hypothesis rests chiefly on the fact that in some diseases, such as malaria in which the white cells of the blood are increased, the spleen is swollen. An animal deprived of its spleen suffers in no detectable manner. This however does not prove the uselessness of the organ as its duties may be taken up by other tissues, in fact, some of the lymphatic glands throughout the body have portions of their structure remarkably like the spleen in appearance, and it has been conjectured that these glands can undertake the spleen's duties, when this organ is removed.

THE THYROID GLAND.—This organ when microscopically investigated has a structure distinctly gland-like except that its acini are closed, that is, do not possess any duct. The acini are filled with a glairy fluid which may be a true secretion, and if so must be absorbed through the blood capillaries or by the lymph system. It is however a matter of doubt whether the thyroid adds something to the blood or whether it removes some poisonous product from the blood. The one thing certain is that in the majority of mammals removal of the thyroid is followed by muscular weakness, sluggish movement, and finally death. In man loss of the thyroid produces the disease known as myxœdema. The human child, bereft by any means of its thyroid, does not grow at the normal rate and at the usual age of maturity may remain a dwarf in body and a child in mind. The marvellous fact is that such a child (a *cretin* as it is called) may be induced to grow normally by administering the thyroid gland of any mammal with its food. Similarly young animals bereft by surgical means of their thyroid will grow normally if the thyroid of a kindred species is grafted in a suitable place in the body. It has been suggested that the thyroid manufactures hormones which regulate growth but it must be admitted that thyroid extract administered to an adult has the reverse action, namely, induces loss of weight. The thyroid gland is placed in the neck caudal to the larynx. It is very richly supplied with blood vessels. When greatly swollen it forms the tumour known as goitre. Associated with it are small glands called the para-thyroids the function of which is unknown.

THE SUPRARENAL GLAND.—This organ has a double origin in embryological development and displays a correspondingly twofold character in its tissue. The central portion, or MEDULLA, arises from the nervous system; the outer portion consists of columns of epithelial cells. Of the function of the outer portion we know nothing. As regards our knowledge of the medulla we are in a more favorable position. It has now been placed beyond doubt that the medulla of the gland produces and adds to the blood a hormone which can be obtained in crystalline form and which is sold in the market under various names such as *adrenalin*, *epinephrin*, *hemiscine*, &c. The chemical constitution of this substance has been determined; it is a derivative of the well known organic compound pyrocatechin. An extract of the suprarenal medulla, or adrenalin itself, if injected will produce all the effects of stimulation of the thoracic autonomic or sympathetic nerves. Thus the arterioles constrict, the pupil is dilated, the uterus contracts, the heart is accelerated, the movements of the alimentary canal are stopped, the hair is erected, &c. The intensity of the effect produced by even minute doses of adrenalin is surprising. Thus $\frac{1}{1000}$ grain injected into the blood stream of a dog may double the blood pressure owing to the powerful constriction of the arterioles as well as the local stimulating action on the heart. A dilute solution placed on a mucous membrane will so constrict the vessels that complete pallor results. The effects of such an injection or application are, however, very temporary. If the suprarenal glands be removed all those functions that depend upon thoracic autonomic stimuli fall into abeyance and there is also a marked muscular weakness and the animal invariably dies (Addison's disease in the human being). Adrenalin is largely used in medical and surgical science on account of its powerful properties. If it accompanies a local anæsthetic such as cocaine, when this is injected subcutaneously or intraspinally, it causes a much slower absorption of the drug. If given by the mouth it produces constriction of the blood vessels

of the stomach and so delays the absorption of the poison, hence its use in emergency treatment. Injected into the blood it may tide over a crisis due to a dangerous fall of blood pressure. It will also stop the bleeding for a time of a raw surface and also, for a time, blanch an inflamed conjunctiva, &c.

THE PITUITARY BODY.—This organ placed in the skull at the base of the brain is also, like the suprarenal gland, of double origin and structure. A nervous part we have met already as an outgrowth from the thalamic region of the brain. The other part is epithelial in character. From the nervous portion an extract can be made which acts like adrenalin but with much less intensity. An extract of the epithelial portion is said by some investigators to increase the secretion of urine by the kidney. That this organ is important is seen by the consequences (or concomitants) of its disease, but of its functions we can say little.

THE THYMUS GLAND (True Sweetbread).—This organ, placed in the thorax in the young animal, undergoes atrophy when maturity is reached. A suggestion has been made that it undertakes duties in the way of hormone formation in youth that are afterwards carried out by the reproductive glands, but we are really quite ignorant of its significance.

TOOWOOMBA CANARY GRASS.

Phalaris bulbosa L. appears to include a large part of the specimens received as "*Phalaris commutata.*" This grass appears to have an exaggerated value attached to it as a fodder plant.

TWO FODDER GRASSES.

It certainly does well in good, rich, fairly moist soils, and is useful to that extent, but for poor and especially dry soils it is far less useful and productive than many already well known grasses, both native and exotic. The accompanying photograph represents stands of *Paspalum virgatum* and of the Toowoomba Canary Grass after one year's growth at the Herbarium with a moderate supply of water, and in rather poor soil. As can be seen, there is no comparison between the two grasses, although they were grown close alongside each other under closely similar conditions. The fodder yield of the Paspalum would be at least three or four times that of the Phalaris.

A.J.E.

BUD-VARIATION IN CORINTH CURRANT VINE.

No. I.

D. McAlpine, Vegetable Pathologist.

About the middle of January, the Horticultural Editor of the *Mildura Cultivator* sent me a specimen which he described as "a freak of nature, or a remarkable case of cross-fertilization, in the shape of a bunch of grapes, half of which are Corinth currants and half Muscat Gordo Blanco. One grape is half of each. It was taken from a currant vine, on which all the other fruit is normal." Photograph No. 1 gives a good representation of this specimen. Towards the foot of the stalk are the ordinary seedless currants, then light and dark variations, about double the size, and the rest consist of round Muscat-like grapes, with a single specimen about the centre, which is a piebald, or half-and-half. Both the piebald and the large Corinth contained a single seed each, and the large round Muscat-like berries contained several seeds each, which have been preserved for future planting.

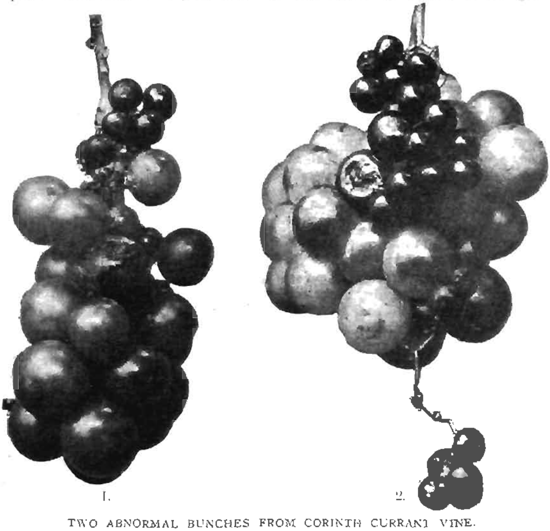
On further inquiry I found that the same vine bore two more abnormal bunches, although, at first, not observed. One, a so-called tendril branch, bearing about eighteen currants and six of the round Muscats; and the other, a very fine one, shown in Photograph No. 2. This consisted of 54 ordinary seedless currants, two piebald, or half-and-half, and 38 of the round Muscats, together with a large currant, about double the size of the normal, and containing one seed.

It appears that, in the Mildura district, the Corinth vine is addicted to such freaks, although not often to the extent of bearing three abnormal bunches on different parts of the same vine, and they are not unknown in some Goulburn Valley vineyards. But, apparently, no one has hitherto followed up and tried to account for this remarkable phenomenon, which is usually dismissed as being merely a "freak" or a "sport," and, therefore, not capable of any reasonable explanation.

On submitting the specimens to Mr. F. de Castella, he was not aware of ever having met with anything exactly similar, even although he has seen the vine growing in many lands, and Darwin, in his work on *The Variation of Animals and Plants under Domestication*, gives several cases of variation in the fruit of the grape, but none so striking as this. He quotes Count Odart's description of a variety which often bears, on the same stalk, small, round and large oblong berries; though the shape of the berry is generally a fixed character. He also mentions the case of the Muscat de Frontignan, in which, on the same foot-stalk, the lower berries "were well-coloured black Frontignans; those next the stalk were white, with the exception of one black and one streaked berry," and altogether there were fifteen black and twelve white berries on the same stalk. But in none of these instances is there anything approaching the production of an ordinary seedless currant, a piebald, and a round Muscat berry, by a Corinth currant vine.

I regard this as an extreme case of bud-variation, as opposed to what might be called seed-variation, or the variation of a plant, as a whole, and not of a part such as a bud. It has been suggested that the variation might be due to cross-fertilization, but it is certainly not a case of crossing, for, even granting that a cross had taken place this season between the Corinth and the Muscat, it would only have affected the seed inside, and not the

fruit generally. No doubt the production of seed might influence the development of the flesh of the fruit, but that is all. It would not account for the fertilized ovary of a Corinth currant assuming the form of a Muscat, and even self-fertilization would only account for the formation of seed and the enlargement of the berry. There is a striking instance of the self-fertilization of the Corinth currant given by A. Jurie, in the *Revue de Viticulture* for 5th September, 1896. One bunch was selected early in the season, before the commencement of flowering, and enclosed in a paper bag, to prevent the access of any foreign pollen. Two other bunches of the same vine were carefully pollinated in the open, one with last season's pollen of Aramon-rupestris-Ganzin, and the other with fresh pollen of the same vine, the object being to compare the virility of fresh pollen with that of a year old. In due course he found, to his great



1. 2.

TWO ABNORMAL BUNCHES FROM CORINTH CURRANT VINE.

astonishment, that the two bunches, which were artificially pollinated, produced only the small grains characteristic of the Corinth, while, on exposing the self-fertilized bunch, he saw a superb bunch with close oblong berries, all equal, and containing pips. (See illustration on page 147.) Thus, neither self-fertilization nor cross-fertilization would account for the production of Muscat-like and piebald berries on a Corinth currant vine. It has been suggested that the dark and the light berries, with seeds, on the abnormal bunches, from Mildura, represent the two parents, from the

crossing of which the seedless grape was derived. It would be interesting to settle, first of all, if the Corinth is the result of a cross; and, secondly, if we have here the original parents from which it was derived. That is one point, at least, which can be determined (although it will take some time), from the seeming erratic behaviour of the bud of the Corinth, as both seeds will be planted, and the cross can afterwards be made. My colleague, Mr. Castella, has kindly supplemented this brief account of a remarkable occurrence, and his large experience and extensive knowledge peculiarly fit him for throwing some light on this perplexing subject.

No. II.

F. de Castella, Government Viticulturist.

I have examined, with much interest, the curious bunches of grapes borne, at Mildura, by a Corinth currant vine, which were brought under my notice by our Vegetable Pathologist, Mr. D. McAlpine, who has already described the occurrence in detail, and obtained photographs of the two specimens. This is one of the strangest freaks of the kind which has come under my notice; it is one which may lead to most interesting results, and, when followed up, may throw light on several questions of wider than merely viticultural interest.

SELF AND ARTIFICIALLY FECUNDATED BUNCHES.

The large question of bud-variation and sporting is concerned, and information may be obtainable which will enlighten us as to the origin of the Corinth vine, which received so little attention in viticultural literature.

Sports are not uncommon in the case of the vine. The Centennial grape is an example. This is a sport from the Waltham Cross variety, which has been fixed and perpetuated by cutting propagation. Sports are responsible for frequent changes in colour, shape, and size of fruit.

Several colour variations of well-known French wine varieties have originated in this way, but such a complete and radical change as the one under notice has not, to my knowledge, been so far placed on record.

Two varieties of vine are grown for the production of currants in Victoria, viz., the Zante and the Corinth. The former, owing to its better-filled bunches, has almost entirely displaced the latter, which differs chiefly from the Zante by the Muscat flavour of its fruit. Like the Zante, its berries are small and seedless, though an odd large berry, containing pips, occasionally makes its appearance.

The number of regularly seedless vines is not large; the two varieties referred to above, and the Sultana (including the closely allied Thompson's seedless) are the only sorts cultivated on a commercial scale in Victoria. The physiological laws governing the development of seedless fruit have not received the attention such an interesting subject would seem to merit.

According to Professor Muller Thurgau, the size of the berry is directly influenced by the development of the seed it contains. Jurie looks upon these seedless varieties as cases of the partial non-setting of the fruit known in French under the name of *Millerand*—a faulty condition in the case of vines which normally bear fruit containing pips.

The Zante, the Corinth, and the Sultana appear to be examples of *Millerand* (a word which has no English equivalent) affecting every berry of the bunch; a condition probably intensified and fixed by artificial selection extending over a long period, for these varieties have been cultivated since early times in oriental countries. *Millerand* would thus, in the case of these seedless varieties, have become their normal condition. Several usually seed-bearing varieties, which are widely cultivated, present the phenomenon of *Millerand;* for example, the Gordo Blanco and the Bicane (known locally as Raisin des Dames). In seasons unfavorable to the setting of the fruit, one finds bunches composed of a few normal, seed-containing berries, mixed with small seedless ones. In the case of the Gordo Blanco, it is these faulty berries, separated after drying, by means of riddles, which constitute the seedless muscatels of commerce.

In an article dealing with the Sultanina, the name by which the Sultana is usually known in France, in *Revue de Viticulture* of 5th Nov., 1898, M. J. M. Guillon writes as follows, concerning the absence of seeds:—"As authors do not agree as to the causes to which the absence of pips in the Sultanina and Corinth are to be attributed, I sought, during my stay in Greece, for some varieties of these 'Cepages' bearing pips. I did not find any. If the Sultanina were a native of Greece, one might conclude that this anomaly is not the result of an accident of vegetation (bud-variation), perpetuated by cutting propagation, but really that of the constitution of the sexual organs of the flower which are sterile."

In the case of the Corinth, the reversion of an occasional berry to what is probably the normal state, that is, containing pips, is not uncommon, but the appearance, in a bunch, of a large proportion of berries, differing entirely as regards size, colour, and texture of skin, from even the seed-containing berries occasionally to be found, is a truly extraordinary freak, and one I should have experienced difficulty in crediting had I not personally examined the bunches, photographs of which are reproduced.

The case under observation appears to be one of bud-variation: possibly a reversion to the type of one of the sexual parents of the original

Corinth currant vine. The Muscat flavour of this grape would hint at one of its parents having been a Muscat-flavoured variety, possibly the Muscat of Alexandria, so largely grown in eastern countries. Partial reversion to this type, though exceedingly curious, is not impossible, and it is in this direction that the solution of this strange puzzle will probably be found. At the present stage, it is premature to say more on the subject, but further developments will be anxiously looked for. It is to be hoped that any vine-growers who note among their vines, anything of a similar nature, will immediately communicate their observation to Mr. McAlpine.

ZANTE CURRANTS GRAFTED ON RESISTANT STOCKS.

P. A. Wyatt, Travelling Assistant Viticulturist.

It is often asserted that the Zante currant vine "does not do well on American resistant stocks." The accompanying illustrations of Zante

ZANTE CURRANT ON RUPESTRIS METALLICA (CAPE).

currant vines grafted on to resistant stocks should go to prove that the assertion is not a correct one. The photographs are those of vines growing at Mr. C. J. Nash's "Elysium" Vineyard, Broken River, Nalinga.

The soil on which they are planted is sandy alluvial, river bank loam, about 25 feet above summer level. The vineyard has never been irrigated in any way. The vines are planted 12 x 10 feet apart, are trellised, and were this season cinctured with a single incision only.

The crop on the vines when the photographs were taken would yield considerably over a ton of very excellent quality of dried fruit to the acre.

Plate No. 1 shows a Zante currant grafted on to Rupestris metallica (Cape) which was planted as a cutting (as thick as a straw) in August, 1903, and vineyard grafted in October, 1906. The second illustration represents a Zante currant grafted on to Riparia gloire. The stock was planted as a cutting in August, 1903, and grafted in the vineyard during October, 1906.

ZANTE CURRANT ON RIPARIA GLOIRE.

In the same vineyard, are Sultana vines grafted on resistant stocks, as well as the same variety on its own roots. These vines are all doing very well. Although Mildura is supposed to be the home of the Sultana in Victoria, Mr. Nash has certainly proved that it can be successfully grown on the Broken River. He has vines of this variety that for their age are as good as any I have seen. Had they been irrigated this season they would have been even better.

RAPE AS A CATCH CROP.

H. W. Ham, Sheep Expert.

Catch crops, as the name implies, convey the impression that there is an element of chance existing about them. There are very few farmers who can expect a catch crop to pay them. Only in areas of our heaviest rainfall are they to be advocated, and only then under certain conditions.

A catch crop is usually sown among the stubbles and cultivated in, or, in some soils, harrowed in. If rain comes through the summer in sufficient quantity it will prove serviceable for putting the finishing touch on sheep and lambs that have not been quite good enough before, but considering that this is the time of year that mutton is cheapest, it is not usually found very profitable. It pays best when the paddock sown is intended to be left out through the winter, ready for spring fallowing.

In this case the cleaning it gets, together with the sheep manuring, is a considerable benefit. The richer the soil and the heavier the rainfall, the greater chance there will be of a fair shoot. A free soil is desirable, not one that sets hard.

About 6 lbs. of good seed, sown evenly broadcast, is an average sowing; 4 or 5 lbs. if the ground is fine, 7 or 8 if the ground is coarse. If the soil be of an exceptionally loose nature there will be a possibility of the rape seed running in behind the harrow teeth to too great a depth; in this case a strong harrowing first, then sowing, and finally a light harrow would be a more correct procedure. There is, however, no hard and fast rule in these matters.

Many farmers hold that superphosphate sown with the seed through the drill is of no great advantage unless it is intended to feed on through the winter, the growing time being so short. Further, it is urged that the fertilizer is very much against a summer crop should no rain come; but if the dry weather plus the super. spoils it, it is not likely to have been worth anything without the super., all the same.

Rape as a fodder plant is at its best for feed value when it bears a blue tinge on the lower leaves; this comes in warm weather. It has then a warm taste and is most fattening for sheep. With summer rape, once a good plant is obtained, it is more fattening in proportion than winter rape, although, of course, nothing like the quantity of growth can be obtained.

There is nothing to be gained by any mixture with rape at this time of sowing, for as a general rule the ground is intended for ploughing in the autumn, and no other fodder plant is so suitable and gives the same feed value for sheep work in the time.

This catch crop is the most serviceable with stud sheep breeders in good rainfall areas. It is splendid to wean ram lambs on to; it also serves as a hospital paddock for weak lambs that have contracted worms (for all lambs and weaners are subject to worms in wet districts), and, as stated in the January *Journal*, rape is the best remedy for wormy lambs. A catch crop of rape is also very useful for aged stud ewes in lamb or rearing lambs; at their age they must have soft feed to do at all well.

While rape at this time of year is of great assistance in curing sick and wormy weaners, and bringing weak sheep through the summer, it is not a good feed from a wool-growing point of view. Apart from the fleece getting earthy, rape grows a harsh, straight fibre. The best of merinoes, showing all the characteristics of merino wool, will when put on a paddock of rape come off after six weeks or two months with a much stronger, harsher, and straighter fibre. For show merinoes it is not a success. With British breeds it is not so much on account of the effect on the fibre that it is disliked, although it is rather objectionable even then, but these breeds allow more dust in the fleece than a merino with a fair amount of yolk and density, and are then not so attractive for show purposes.

Before sowing a catch crop a farmer should consider his chances of summer rain, his intentions as to sowing the paddock with a general crop, and what chances he has of getting stock to turn on, to bring him in a profit for the time and outlay.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

POISONINGS.

(*Continued from page 110.*)

FORAGE POISONING.

"Staggers" or Forage Poisoning in Horses.

The subject of "Forage Poisoning" also known as "Stomach Staggers" was dealt with at length in the *Journal* for April, 1907.

Sorghum Poisoning.

An article on "Sorghum Poisoning" appeared in the March, 1908, issue of the *Journal*.

Ensilage Poisoning.

Ensilage is not a suitable food for working horses. Its nutritive ratio is usually too "wide"; that is, for its bulk it contains too little nutriment and consequently horses to be sustained on it alone need more than their small single stomach is able to contain or digest properly. But it is seldom a cause of sudden mortality in horses fed on it unless it has been improperly made or has become deteriorated by too long exposure to air after being opened up. Some years ago the deaths of a number of horses in the St. Arnaud district of Victoria were attributed to poisoning by ensilage that had become mouldy; and a somewhat extensive series of fatalities occurred in Coonong in New South Wales as a result apparently of feeding on decomposing ensilage. In this latter case the horses had apparently become weakened and debilitated by being fed on ensilage for six months before the fatalities commenced. In this connexion the following extracts from a report by Mr. Ed. Stanley, F.R.C.V.S., late Government Veterinarian of New South Wales, on the Coonong cases is interesting and informative. He says:—

"For the last six months the station and working horses have been fed entirely on ensilage, and are said to have put on fat for the first few weeks, while they were idle. At that time they were having a spell. When put to work they were soft, and soon lost their condition.

About the middle of June a second silo was opened. This contained about 100 tons of wheaten hay, cut while green and with grain in the ears, grown on 130 acres in the swamp paddock. This paddock was flooded early in September, when the crop was yellow from drought and about 6 inches high. It grew rapidly until cut, and was not noticed to have been other than healthy. No one remarked rust or blight of any kind, but such a condition may or may not have existed.

The ensilage appeared to be good; but the horses were remarked to be sluggish and spiritless. They sweated a good deal while at work, and all got thin. Some had diarrhœa. These matters were not heeded at the time, beyond the manager thinking that the work was reducing the animals. The manager gave a few oats with the ensilage to the horses engaged in tank sinking. The silo pit being 2 miles from the station, and 3½ miles from the tank work, necessitated a three or four days' supply being fetched from the silo twice a week (instead of being fresh every day, as

it ought to be). If kept over three days it became whitened with a fungus like mould, and became rotten and stinking. Usually, the feed troughs were cleaned out before fresh ensilage was given, but not always; hence, the mould fungus was cultivated. This went on for three weeks, some of the horses working down thin. As soon as the tank was finished, they were turned into paddocks for a spell. (Grain is very scarce in this district.)

The first case of illness noticed was a station mare in a yard standing at the feed trough at midday on 3rd July. She was bled, and a dose of oil was given her. She died on the evening of that day. This mare had eaten nothing but ensilage for the preceding eight days. Previously she had been in a grass paddock.

The next animal noticed to be ill was one of a pair used to draw out the dead animal. She had eaten ensilage for nine days. She was in a low condition, and was nearly knocked up while employed at the work. On the same day she died.

The third animal taken ill was a valuable four year-old draught entire horse. He had never been in the paddock, nor had he been worked. He was kept in the yard during the day, and was put into a stable at night. He had been fed on ensilage only for the last six weeks. It was noticed that he was lying in the yard on Saturday. He was bled, and oil was given to him. He died the same night.

The fourth animal attacked was a station hack. He had been fed on ensilage only for six weeks; was taken ill on Sunday and died on Tuesday.

The fifth animal taken ill was a draught horse. He had been tank-sinking, and had been kept at the tank with the other horses. He was 5 or 6 miles from the station, and there fed on ensilage and a few oats for six weeks. He was turned into a paddock situate 4 miles from the station with several others when the work was completed. On Monday he was seen ill, and was too weak to walk home. He fell and died in the paddock during Tuesday night.

The sixth, a draught horse (companion to the last-mentioned), seemed all right on Monday. On Tuesday he was lying down. Upon being roused up, he walked weakly. He staggered a quarter of a mile, fell into a crab hole, and died the same night.

And so on with ten more hacks and draughts, every one of them working horses, fed on similar ensilage. Their water supply had been obtained from various sources—crab holes in the paddocks filled by the recent rains, tanks, and station creek water. Water from the same sources was used for domestic purposes and for cattle, sheep, dogs, and swine.

This mortality had occurred before my arrival. There were several horses still alive, but ill. The symptoms in all the cases I saw were alike—varying only in degree. These were listlessness, prostration of strength, sore throat (without swelling or pain upon manipulation). Extreme irritation was shown by liquids being swallowed with great difficulty, although thirst was marked. Food and water were both returned through the nostrils; this often being accompanied by fits of coughing. This abnormal process is still seen in the convalescents, now feeding well. There was constipation with straining, the dung being dark-coloured and most offensive. The urine was passed freely in large quantities. It was of the usual colour and clear. It presented nothing diagnostic

on examination. The pulse was small, hard, feeble and indistinct. The heart was irritable and laboured, ranging from 40 to 60 beats per minute. Respiration was slightly accelerated; but with feeble chest and abdominal movements. Visible mucous membranes were of a dirty brownish-yellowish colour. The tongue was pasty and dry, emitting a horrid nauseating odour, almost unbearable. The temperature ranged from 95 degrees to 100 degrees. The extremities were cold. There was no indication of suffering from pain, of inclination to lie down, or of cerebral or spinal disturbance. The animals were conscious up to the last and attempted to eat and drink, even when lying prostrate and unable to rise. Mastication was very slow, as if from muscular weakness, and quids were often retained in the mouth. The horses could scarcely swallow fluids, but could eat dry oaten hay. Drenching always caused coughing so that medicine had to be given in other ways.

I made two *post-mortem* examinations. One was of a horse that died on the night preceding our arrival; the other animal died on the night after our arrival. (None of the animals under treatment died during our stay.)

The *post-mortem* appearances, as briefly as possible, and avoiding technicalities, were as follow:—Congestion of the nasal passages, larynx, and tracheæ. This was more marked in the first case. The tongues were dry and thickly furred. The pharynx was inflamed, but free from ulceration or diphtheritic deposit. The stomachs and large intestines were of a brownish-black colour, the mucous membrane being deeply stained. The stain would not wash off. The contents were soft. The bowels were less affected. The contents of the rectum were dry and hard. The peritoneum was stained in large patches of a ruddy colour, and the mesenteric veins were filled with black coagulated blood. The bladders were ecchymosed in a most remarkable manner. The heart was flabby, dark in colour. Extravasations of blood occurred along the course of the blood vessels, and also on the fleshy pillars inside the ventricles. Both right and left cavities contained firm clots of blood, formed partly of yellow lymph and almost black blood, separated by gravitation. The liver was dark, and slightly ecchymosed. The spleen was healthy in appearance. The lungs, in one case, were full of congested blood, and the tracheæ and bronchial tubes were greenish-black in colour. In the other case, the lungs were nearly normal. I noticed the entire absence of fat, which circumstance is very unusual in the horse. I also noticed the presence of many intestinal worms, four varieties being recognised. No bacilli were in the blood.

Treatment consisted in evacuating the poison, and restoring the blood to its normal condition by the judicious administration of salines and antiseptics, with easily-digested and nutritious food. The sufferers were sheltered at night from the cutting winds. General attention was given to cleanliness and comfort.

As a means of prevention, I suggest the institution of change of feed for ensilage, such as chaff, with bran, oats, oaten hay, and grass—and a constant supply of salt within their reach.

It is to be noted that these horses have been living on ensilage from the first pit for the last six months, getting a fresh supply daily, and that they did satisfactorily on it.

Cattle and sheep do well on this artificially-preserved food; but it is never advisable to limit animals to one article of diet. Change of food is as necessary for them as it is for human beings. No doubt, ruminating

animals, which have only to eat and sleep and time to browse over the paddocks, stand a far better chance of thriving on food of this character than the single-stomached, hard-worked horse, who is required to exhaust his muscular strength day by day, so that he cannot thrive and work unless fed on clean and wholesome food with concentrated nutriment in small bulk. Hence, grain of some kind or other is his usual fare.

Ensilage should be used in conjunction with other feed, and care should be taken that it is not used if damaged by age or exposure to the air. Mixed grasses would make a more nutritious ensilage for horses than growing grain. Wheat and wheat straw are both unsuitable, and are bad feed for horses. In the form of ensilage, this fodder is soft, and is not wholesome as a stable diet.

The unfortunate fatality leads me to the conclusion that ensilage exposed to the air for a very few days, under favorable climatic conditions, such as moisture and temperature heat, forms an excellent seed-bed and nourishing medium for fungoid growths, such as moulds and low forms of vegetable life. Their germs, being always present in the air, are increased to myriads under favorable conditions, and such undoubtedly existed in this outbreak. Rain having recently fallen, following on a long period of heat and drought, and the horses being weak, predisposed them to the ill effects of the fungus, which not only entered their systems through the stomach, but also during respiration. Being exposed to the same poisonous agents day after day, chronic poisoning and fatal consequences followed.

Sixteen valuable horses died. Eleven horses were treated. Ten of the latter are convalescent, recovery being a slow process. One animal, I fear, is incurable, it being dangerously ill, utterly prostrate and delirious.

There are several other horses scattered on the station; but these have not had ensilage. They are all healthy."

POISONING BY MOULDS, RUST AND SMUT.

Moulds of various kinds, principally those of the genera *Mucor*, *Aspergillus* and *Pencillum*, attack the different foodstuffs of animals. When mouldy foods are partaken of in large quantity, which only occurs when other foods are not available, the general toxic action is characterized by contraction of the pupil, paralysis of the vaso-motor system, diminution of respiration, loss of power of muscular contraction, drowsiness and convulsions. The consumption of mouldy hay, oats and meal generally produces colic and diarrhœa and it has been known to cause inflammation of the bowels (enteritis) in horses. The poisonous principle is not the mould fungus but a toxic excretion (ptomaine) which emanates from it during growth.

Rust.—The most common rust fungus is the *Puccinca graminis* which attacks cereals. The feeding of rusty straw gives rise to flatulence, hoven (tympanitis) and constipation which may be so aggravated as to end seriously if the cause is not discontinued.

Smut or Black Rust.—*Tilletia caries* is the most poisonous variety of smut, *Ustilago maydis* and *Ustilago segetum* being less harmful. When grain attacked by caries or smut is eaten, inflammation of the bowels may ensue. Bronchitis and inflammation of the lungs may also be caused by inhalation of pulverized smut grains. Abortion has frequently been known to supervene on the ingestion of *Ustilago maydis*. There is also a

rust called *Ustilago hypdytes*, a species of *Penicillium* which attacks grasses or hay and appears to be poisonous. It produces considerable irritation of tissues or surfaces that it comes in contact with.

GENERAL REMARKS.—Many cases of inappetence, colic, flatulence and constipation are caused by the eating of mould, rust, or smut-impregnated food without the true cause being suspected. Hence the necessity in such cases of always carefully examining the food. In acute cases of this kind there is often great depression and stupor. The primary constipation may be followed by a profuse fœtid diarrhœa which may be accompanied by pain and straining. The coat becomes harsh and staring and the animal rapidly falls off in condition. The fact of several animals in the stable becoming ill at the same time should direct attention to the food. Polyurea associated with parenchymatoms nephritis (inflammation of the kidneys) frequently follows on the feeding over a lengthened period of damaged food. Mr. Edward Stanley, F.R.C.V.S., late Government Veterinarian for New South Wales, had experience of considerable mortality in sheep from feeding on rusty wheaten hay. It appeared that 30 or 40 tons of wheaten irrigated hay had become rusty, and were cut and put along with some old haystacks for the time of scarcity, which came this season during the drought. Seven thousand ewes were fed on hay, and it was noticed that those fed on rusty hay became ill, and many died within a week with symptoms described as a sort of blindness, fits, staggering gait, prostration and death; the lungs were of a blackish colour and the liver peculiarly light in colour. The last two loads of the rusty hay killed about 100 sheep: between 400 and 500 were lost, and a good many more affected before the cause of the malady was suspected. The sickly ewes were moved and fed on boree, and many recovered. Four thousand weaners fed on good hay in the same paddocks, and using the same watering places, were not affected in the least.

TREATMENT.—A change of food must be at once adopted. The fermenting food in the intestines should be got rid of by purgatives and enemas and the fermentation may be arrested by giving 15 to 20 gramme doses of naptho. Intestinal acidity should be counteracted with bicarbonate of soda and some stomach cordial such as ginger, mustard or pimento given.

Mr. Stanley has also furnished me with the following notes of this class of poisoning. He says:—"Fungi, moulds, ergot, rusts, &c., these I am satisfied cause a great amount of obscure illness, which is only recognised by scientific veterinarians, and many outbreaks of mysterious diseases, and large fatalities to stock are due to these insignificant parasitic plants.

Mouldy lucerne, not necessarily rotten, but merely dusty, is highly dangerous for horses. Being a slow poison it is unsuspected. Meanwhile the horse suffers irritation in nasal membranes, bronchial tubes and lungs, then the circulation is invaded, and finally the kidneys and bowels show effects. The pulse is depressed and indistinct, breath fœtid, respiration short, bowels constipated, urine scanty, skin hide-bound. There is gradual wasting of flesh, although the appetite is not impaired until the illness is established. Then the throat muscles, neck, back and limbs become hard and inelastic. The animal walks in a cramped position as if sore all over, plaits his legs, cannot eat from the ground, drinks slowly and with difficulty from a bucket in the manger, rarely lies down voluntarily. If he falls he lies with limbs extended and has very great difficulty in getting up again. The limbs and joints all swell, in association with the dullness and want of exercise. The cough is low and often remains chronic from structural changes in the lungs, and the respiration resembles that of

broken wind, that is requiring a double expiratory effort to expel air from the lungs. The eyes suffer, the pupils being dilated and the horse afraid to enter a stable door.

Treatment.—Complete change of food, saline aperients, and diuretics, then tonics and several weeks rest before working.

Many horses so affected, because they continue to eat although losing flesh, and being low spirited, are ignorantly overworked and die, the cause of illness being unsuspected.

Maize in the ear gets sometimes flooded, or is so saturated with rain, as to get mouldy in the cob; this is not seen outside the grain but at the hilum, its point of connexion with the pith. Being discoloured it is not readily marketable, and farmers feed it to horses and pigs. I have seen much illness with fatal results follow.

Planter's friend, sorghum and corn straw are all liable to rust similar to wheat straw, and are then dangerous food, as also is ensilage which has become mouldy.

Where appliances are available fodder damaged by moulds, &c., should be steamed thoroughly before being blended with other food."

Poisoning by Scum on Water.

"Francis, of Adelaide, records (in *Nature*, February, 1878) the effects of a *Conferva* indigenous and confined to the lakes forming the estuary of the Murray River. It is considered to be *Nodularia spermigera*, allied to *Protococcus*, and floats on the surface of the water, being wafted to the lee shores and forming a dense scum like green oil paint, some 2 to 6 inches thick, and as pasty as porridge; it is swallowed by animals when drinking, and sheep die from its effects in one to six or eight hours, showing stupor and unconsciousness, falling and remaining quiet as if asleep unless touched, when convulsions come on, with head and neck drawn back by rigid spasm, which subsides before death. The scum given experimentally in doses of 30 ounces caused death in fifteen hours, and autopsy showed no green scum in the stomachs, but their contents dry; two pints of serum in the abdominal cavity; heart flaccid but not pale; much effusion of serum around the heart. Dura mater congested. Blood black and uncoagulable, did not become scarlet on exposure to the air."*

Fungus Poisoning.

"It has been observed that no hard and fast rule can be laid down as to which of the fungi are poisonous, and which are not, *e.g.*, the common mushroom (the *Agaricus campestris*), an article of diet in England and Australia, is a deadly poison in Russia; and other species, which are eaten with impunity in Italy and Switzerland are known to produce poisonous effects when grown in England. Thus it is seen that climatic and other influences have a great deal to do with the formation and elaboration of its active-principle 'fungin,' which is said to be of a volatile nature and soluble in water. It is certain that if a fungus be grown in any other than its proper season, or in a dark place, that the elaboration of the 'fungin' will be increased, and, therefore, the fungus should be looked upon with suspicion."†

Poisonous fungi have a styptic astringent taste and are described by Taylor as narcotico-irritant poisons.

* Steel's Diseases of the Sheep.
† H. H. Edwards, in the *Australasian Veterinary and Live Stock Journal*, July, 1890.

Edwards records‡ a case of cattle poisoning from eating the common toad-stool or puff-ball (*Lycoperdon giganteum*). Two cows which were afterwards found to have eaten from fifteen to twenty large puff-balls were affected. The primary symptoms were:—Abdominal pain, bowel disturbance and accelerated breathing. These were followed in a short time by great depression, reeling gait, tympanitis, unconsciousness and death. Puff-ball skins were found in the paunch and the fluid in the fourth stomach and first part of the small intestines were tinged with the purple contents of the fungus, which had produced inflammatory changes in the lining of the stomachs and bowels.

Ergotism.

Ergot of rye is a fungoid growth occurring on the ears of certain cereals, principally those of the rye family. The plants become affected just before the seeding period by the lodgment on them of spores of a fungus called *Claviceps purpurea* (*Oidium abortifaciens*). The spores develop a myselium and the growth ultimately assumes the appearance of a cock's spur protruding from the ear in place of the natural grain—hence the common name "horned rye" (*Secale cornutum*). Its poisonous properties depend on the presence of complex active principles of which ergotin and ergotinin are named compounds. These active principles have a special action on vaso-motor nerves and on the involuntary muscular fibre which becomes tonically contracted under their influence—hence the violent contractions of the muscular wall of the womb which produces abortion, and the dry gangrene of the extremities resulting from constriction of the blood vessels and consequent cutting off of the blood supply. One form of foot-rot in sheep is stated to be due to gangrene of the hoof consequent on ergotism.

When a largely ergotized crop is eaten by stock a condition of ergotism is set up of which the most prominent SYMPTOMS are dysentery and diarrhœa consequent on bowel inflammation. Abortion of in-calf cows is an almost constant accompaniment but pregnant ewes are not so frequently affected in this way.

TREATMENT.—Tannin is the required antidote and agents which overcome spasm such as morphine and chloral hydrate should also be given.

ANIMAL POISONINGS.

Snake Bite.

Deaths of animals from snake-bite do not occur so frequently in Australia as might be expected considering the number and variety of venomous snakes that infest partially-cleared bush used for grazing. This infrequency of snake-bite in animals may in part be accounted for by the often observed fact that most of the Australian varieties of snake are not aggressive. Unless they are attacked or unless they are intercepted in their progress towards their hole they apparently prefer to make away from, rather than to attack, man or animals; and it may be assumed that the quiet movements of grazing animals do not excite them to the biting point. The question of dosage has also to be considered in this connexion. It may be that many animals are bitten but that the amount of venom injected is not sufficient to produce a fatal effect, for it is easily conceivable that what would be a lethal dose for a human being would produce only a passing indisposition in the larger domestic animals. Again, the hairy

‡ H. H. Edwards, in the *Australasian Veterinary and Live Stock Journal*, July, 1890.

coat of cattle and horses and the woolly covering of sheep, together with the thickness of the skin, is likely to have a mechanical effect in preventing effective biting.

The most commonly met with venomous snakes in Australia, in the order of their venom-virulence, are:—The black snake (*Pseudechys porphyriacus*), the brown snake (*Diemenia superciliosa*), the tiger snake (*Hophlocephalus curtus*), and the copperhead snake (*Denisonia superba*). The death adder (*Acanthophis antarctica*) is also particularly venomous. The diamond and carpet snake (*Python spilotes*) is non-venomous.

Course and Symptoms.—Little opportunity is usually afforded for studying the course and varying symptoms following on snake-bite or for observing *post-mortem* the changes produced. The indisposition of animals at grass is seldom noticed and in snake-bite death usually occurs before suspicion has been aroused. If the course is not too rapid, a local swelling develops at the seat of the bite and this may be observed on the carcase until it becomes obliterated by putrefactive distension. According to the variety of snake the venom produces symptoms of delirium or of unconsciousness. They are preceded by shivering fits, trembling, a staggering or reeling gait, profuse perspiration, hurried breathing, staring eyes and anxious expression of countenance. These symptoms present themselves within half an hour or an hour from the time of the bite and in fatal cases they gradually intensify until a condition of profound torpor and unconsciousness is reached in from three to thirty hours during which the animal dies.

A peculiar effect of the artificial injection of snake venom was observed during the carrying out of experiments at the Melbourne Veterinary College in 1896 concerning the immunization of horses against snake-bite. A maiden mare was one of the subjects and she was injected repeatedly with gradually increasing doses of snake venom. In addition to the ordinary symptoms after each injection the udder became congested and milk was produced in such quantity that it spurted from the teats. The swelling and formation of milk ceased on the subsidence of the other symptoms and the udder remained normal until a succeeding injection. The phenomenon was repeated on six or seven different occasions.

Treatment.—On account of the dose of venom received being usually proportionately less than in the case of man, the treatment of snake-bite in horses and cattle is more likely to be successful. Promptness in the application of remedial measures is a prime necessity. If the bite is on a limb a narrow bandage or tourniquet should be applied above the seat of the bite. It should be drawn sufficiently tight as to practically stop the circulation or, at all events, the flow of blood in the veins towards the heart. The bandaging will be more effective if a pad of cork or rubber is adjusted over the course of the main veins of the part in such a manner as to cause pressure on them and so stop the flow of blood.

If the seat of the bite can be located, excision of the part with a sharp knife or scalpel should be promptly effected, and the raw wound rubbed with crystals of permanganate of potash (Condy's crystals).

The general treatment should comprise the giving of stimulants, which act as physiological antidotes and antagonize the depressing effect which the venom produces on the central nervous system. Sulphate of strychnine (in half-grain doses dissolved in boiled water) injected subcutaneously with a hypodermic syringe is the best stimulant for the purpose. Strychnine however is not always on hand and its administration presents difficulties.

The next best remedy is perhaps ammonia. From one to two tablespoonfuls of the strong liquid ammonia (liq. ammon. fort.) may be given as a drench in a quart of cold water; or the solid carbonate of ammonia in ounce doses may be given as a ball or dissolved as a drench. Failing either of these remedies being available, whisky or other alcoholic stimulant should be tried, the dose in such cases being 5 or 6 ounces. Whatever medicine is used it should be repeated at intervals of an hour. Strychnine may be given with safety until a spasmodic twitching of the muscles is produced.

STATISTICS.

Rainfall in Victoria.

FOURTH QUARTER, 1908.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	October.		November.		December.		Total for Fourth Quarter.*	Average for Fourth Quarter.	Total Amount for Year 1908.*	Yearly Average.
	Amount, 1908.	Average.	Amount, 1908.	Average.	Amount, 1908.*	Average.				
	points	points	points	points	points	points	points	points	points	points
Glenelg and Wannon Rivers ..	362	275	129	174	66	153	557	602	2,492	2,710
Fitzroy, Eumeralla and Merri Rivers	387	291	117	182	84	159	588	632	2,934	2,982
Hopkins River and Mount Emu Creek	292	276	154	197	64	151	510	624	2,223	2,617
Mount Elephant and Lake Corangamite	217	267	143	187	63	139	423	593	2,008	2,484
Cape Otway Forest	338	366	135	239	100	189	573	794	3,529	4,056
Moorabool and Barwon Rivers ..	237	256	135	203	50	156	422	615	1,869	2,553
Werribee and Saltwater Rivers ..	226	268	107	218	20	169	353	655	1,558	2,680
Yarra River and Dandenong Creek	331	323	123	286	70	259	524	868	2,577	3,518
Koo-wee-rup Swamp	296	349	147	266	54	214	497	829	2,480	3,469
South Gippsland	264	349	151	280	60	259	475	888	2,809	3,914
La Trobe and Thomson Rivers .	315	353	144	279	55	256	514	888	2,492	3,620
Macallister and Avon Rivers ..	227	282	119	234	44	226	390	742	1,427	2,690
Mitchell River	245	291	199	225	65	212	509	728	1,812	3,048
Tambo and Nicholson Rivers ..	271	277	199	196	67	215	537	688	1,996	2,913
Snowy River	453	303	164	249	53	309	670	861	3,017	3,813
Murray River .. .	158	192	92	158	68	135	318	485	1,716	2,211
Mitta Mitta and Kiewa Rivers ..	266	305	256	248	89	194	611	747	2,969	3,470
Ovens River	229	388	217	295	79	236	525	917	2,779	4,133
Goulburn River	222	242	99	199	82	148	403	589	2,024	2,626
Campaspe River	162	229	118	183	50	150	330	562	1,694	2,650
Loddon River	210	172	102	153	50	113	362	438	1,473	1,901
Avon and Richardson Rivers ..	205	142	91	125	32	98	328	365	1,520	1,587
Avoca River	221	167	73	139	39	105	333	411	1,461	1,747
Eastern Wimmera	231	242	101	159	42	140	374	541	1,937	2,245
Western Wimmera	237	205	80	125	64	117	381	447	1,856	1,973
Mallee country	231	120	36	92	40	76	316	288	1,403	1,383
The whole State	241	236	111	180	60	156	412	572	1,984	2,522

* Figures in these columns are subject to alterations when the complete number of returns for December has been received.

R. F. GRIFFITHS,
Acting Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 31.12.1908.	Quarter ended 31.12.1907.	Quarter ended 31.12.1908.	Quarter ended 31.12.1907.
Butter	lbs.	12,903,248	19,271,974	9,387,112	14,052,640
Milk and Cream ...	cases	6,287	15,406	137	...
Cheese	lbs.	234,600	354,360	7,110	6,000
Ham and Bacon ...	"	439,440	883,040	...	...
Poultry	head	1,125	22,465	3,434	7,232
Eggs...	dozen	960	18,306	538	..
Mutton and Lamb	carcases	443,754	540,053	108,603	120,778
Beef	quarters	1,164	113	803	...
Veal	carcases	4,105	930	356½	371
Pork...	"	76	61	..	...
Rabbits and Hares ...	pairs	23,466	115,122	3,075	22,082
Sundries	lbs.	...	...	11,344	44,583

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.		Goods	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.		Inter-State.	Oversea.	Inter-State.	Oversea.
Apples ...	17,539	1,317	333	—	Nutmegs ...	—	212	—	—
Apricots ...	42	—	3,879	482	Nuts ...	28	1,270	4	—
Asparagus...	—	—	2	—	Oats ...	2,198	—	—	—
Bananas, b/s.	73,569	—	—	—	Oranges ...	41,175	1,634	150	431
Bananas, c/s.	13,386	671	795	46	Passion fruit	2,163	—	50	[illegible]
Barley ..	1,325	—	—	—	Paw-Paws	1	—	—	—
Beans ...	3,952	112	1	—	Peaches ...	607	—	1,467	33[illegible]
Bulbs ...	1	310	9	—	Pears ...	3	—	—	—
Cherries ...	272	108	20,745	3,625	Peas ...	1,988	—	4	—
Chillies ...	9	—	—	—	Pineapples	8,623	5	61	11[illegible]
Cocoanuts ...	60	—	1	—	Plants ...	190	91	170	8[illegible]
Cucumbers	5,977	—	128	20	Plums ...	9	—	114	64[illegible]
Currants ...	49	—	—	—	Popcorns ...	—	5	—	—
Dates ...	274	5,375	—	—	Potatoes	6,391	2	—	—
Figs ...	-	272	—	—	Raspberries	—	—	7	—
Gooseberries	—	—	69	—	Rhubarb ...	—	—	9	—
Grapes ..	14	—	42	—	Rice ...	3,134	7,963	—	—
Green Ginger	—	92	—	—	Seed ...	294	4,583	5	—
Lemons ...	1,967	5,343	558	964	Strawberries	93	—	5	—
Limes ...	—	—	1	—	Sugarcane	—	4	—	—
Loquats ...	1,646	—	48	10	Tomatoes ...	10,055	—	27	6[illegible]
Mace ...	—	21	—	—	Turnips ...	57	—	—	—
Maize ...	1,067	316	—	—	Vegetables	—	309	—	—
Malt ...	19	—	—	—	Wheat ...	1,492	86	—	—
Mangoes ...	30	—	—	—	Yams ...	—	72	—	—
Marrows ..	51	—	—	—	C'nned Fruits	—	—	—	1,84[illegible]
Melons ...	56	—	—	—	Dried fruits	—	8,270	—	1,18[illegible]
Mixed fruits	1	1	42	—	Jams, &c. ...	—	—	—	1,24[illegible]
Total ...	121,306	13,938	26,653	5,147	Grand Totals	199,807	38,444	28,726	11,09[illegible]

Total number of packages inspected for the quarter ended 31st December, 1908 = 278,068.

J. G. TURNER, *Senior Inspector, Fruit Imports and Exports.*

PROGRESSIVE FARMING.

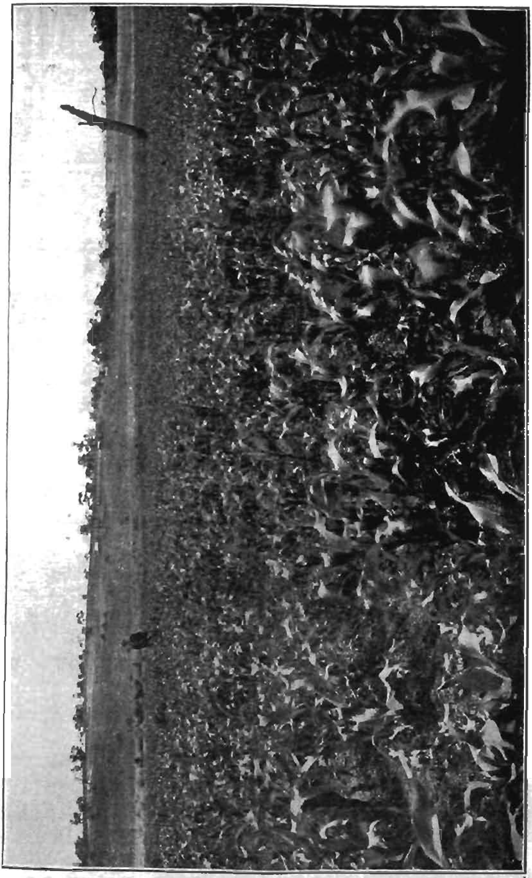
No. 2.—Dean's Marsh.

T. Cherry, M.D., M.S., Director of Agriculture.

I have frequently pointed out through the columns of the *Journal* that the problem of progressive improvement of the poorer class of land in Victoria is essentially one of the application of phosphoric acid combined with the keeping of increasing numbers of live stock. Increased cultivation may also be considered an essential part of the scheme, at least as far as its practical application is concerned. In theory the same results may be obtained by grazing, but in practice the amount of fodder necessary to provide sustenance for the increasing number of animals can only be obtained by the use of the plough. Our illustrations show the above principles turned to practical account at the farm of Mr. J. Stewart, Dean's Marsh.

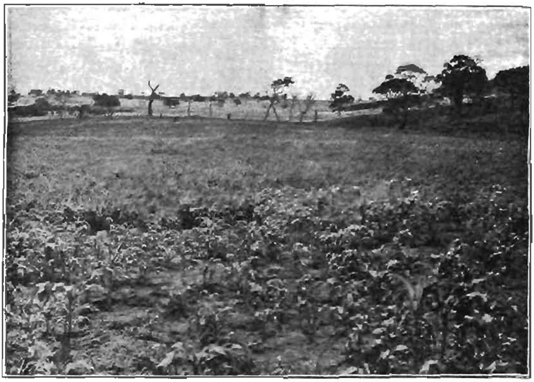
YOUNG CROP OF MAIZE AND MILLET.

This land originally formed part of the Yan Yan Gurt estate and consists of the sandy soil and sandy loams, frequently met with in the coastal districts of Victoria. The rainfall is approximately 30 inches per annum. Originally the land was heavily timbered with fairly large trees. These had been ringbarked from the early days, so that most of the dead trunks have fallen and disappeared. As was so frequently the experience of the pioneers, the growth of scrub and saplings proved a more formidable task than the original forest with which the hills were clothed, and consequently the land has not only to a large extent reverted to a state of nature, but the task of bringing it again into cultivation is far greater than would have been the case if the land were in its original condition. In many parts the growth of wattle scrub is rather a noticeable feature of the landscape.



MAIZE READY FOR THE SHEEP.

Mr. Stewart has taken in hand the systematic cultivation of both winter and summer fodder crops. The grazing off of the paddocks of oats and

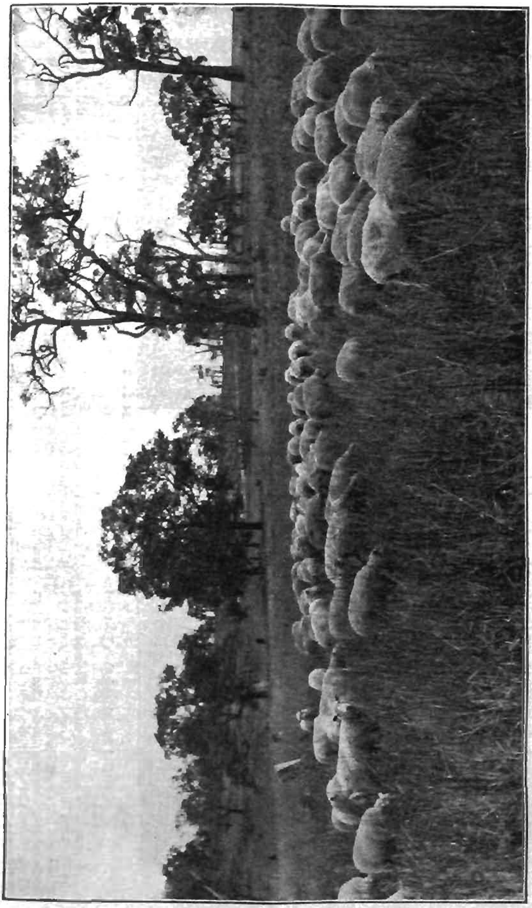


MAIZE, JAPANESE MILLET AND RAPE.

barley together with the provision of autumn sown rape forms part of the routine methods adopted, but a distinct step in advance has been

JAPANESE MILLET AND RAPE.

taken by the provision of maize, amber cane, Japanese millet and rape as pasturage for the sheep during the summer months. These crops are all



THE LAST OF THE OATS AND RAPE.

TUSSOCK AND BIRD'S FOOT TREFOIL.

Original Tussock and Bird's Foot Trefoil.

Tussock half suppressed.

A couple of miles from Mr. Stewart's homestead is found Gladman's Flat, the original home of Bird's Foot Trefoil in this portion of the Western District. About twenty years ago the plants were introduced on to this flat from a neighbouring garden, where they had been cultivated from seed brought from Germany. The swampy flat was thickly covered by large coarse tussocks, but the tussocks have, to a large extent, been completely exterminated by the combined action of the trefoil and the grazing of the dairy cattle. As shown in our illustrations, the trefoil climbs up the tussocks, often reaching from 2 to 3 feet in height. As the cattle graze the trefoil they nip off the out-growing parts of the tussock, and this process goes on until the tussock becomes insignificant in size and finally disappears. Two

drilled in during the early part of December. Some portions of the paddock are sown with one variety alone. In other parts two are mixed and in some portions three may be seen springing up together. From the experience obtained last summer it is found that the sheep take to the Japanese millet and amber cane first, leaving the rape and maize to be negotiated at a later stage of growth. No difficulty has been experienced by the sheep up to the present in feeding off the largest stems of the maize and amber cane grown in this way. Naturally it takes some little time for them to become accustomed to the unusual kind of fodder, but like the pigs of Eastern Gippsland it is not long before they become thoroughly at home amongst the largest maize stalks. The effect of crowding a large number of sheep on a comparatively small area bearing a heavy crop of succulent vegetation in the middle of summer rapidly becomes apparent. Lambs, wethers and ewes alike continue thriving and sappy at a period when without this provision they would either come to a standstill or else go backward. From the point of view of the sheep there is no doubt that this method is an absolute success. The effect from the point of view of the land will take a few years to fully demonstrate, but if we can draw any conclusions from the experience which underlies the best farm practice in all parts of the world there can be no doubt, whatever, that the incorporation of large quantities of sheep manure into the soil will very soon produce notable effects.

THE HOME OF THE BIRD'S FOOT TREFOIL.

Mr. Stewart has up to the present grown the following areas of crop, and supplies particulars of the feeding off as under:—

1907.—Seventeen acres sown on 8th May with $1\frac{1}{4}$ bushels barley and 2 lbs. rape with 56 lbs. superphosphate.

BORDER LEICESTER AND SHROPSHIRE RAMS.
(At end of season—newly shorn.)

Forty-one acres sown 25th August, with $\frac{1}{2}$ bushel each oats and barley, and 2 lbs. rape, with 1 cwt. superphosphate. This crop was only disced in, and was not a great success owing to the big growth of bracken ferns.

1908.—Seventeen acres Japanese millet, and eleven sorghum (5 lbs. seed in each case) sown 1st January with 56 lbs. superphosphate. This crop carried the lambs after weaning for three months.

SHROPSHIRE X CROSSBRED—BORDER LEICESTER X COMEBACK.

Sixty-two acres sown early in May with 1 bushel oats and 2 lbs. rape to the acre, with 56 lbs. superphosphate. This crop was started

to be fed off in September, and carried 760 ewes and lambs for 3½ months, and in addition an extra 350 weaners for one month of this time; that is for one month of this period the 62 acres carried 1,110 head.

Forty-seven acres planted in November—21 acres maize and 26 Japanese millet and rape. On the 8th January, 1909, 180 ewes with their lambs were turned into this paddock. In two weeks, 60 lambs were sent off fat, and 60 dry ewes were put in their place. A fortnight later, 107 ewes and 122 lambs were sent off fat, and the paddock cleared with the exception of 64 forward ewes (dry), which are on the crop now and ready for market.

To summarize: The crop carried 484 head of sheep (ewes and lambs) for four weeks, of which 349 head were sent off fat, and since then 64 more have topped off. We found that the sheep left the maize alone at first, giving their attention to the rape and millet. When they did start on the maize, however, they stripped the leaves off in a very short time, after which they chewed the stalks, until now there is only about a foot of the stalk left. There is still a fair amount of feed in the stalk yet,

EXPORT LAMBS—BORDER LEICESTER X CROSSBRED, SHROPSHIRE X COMEBACK.

and eventually, no doubt, the sheep will eat the lot. With rain and a spell, there would be a good second growth of millet and rape, but owing to the abnormally dry season, and the grasshopper plague, we have been unable to spell the paddock yet.

In addition, 15 acres of millet and rape were sown in December, 1908, but failed to get a start, as the grasshoppers nipped off the young shoots as fast as they appeared. We consider that much better results can be obtained by having the crop in two paddocks, so that they can be spelled alternately.

The following notes on the sheep are supplied by Mr. H. W. Ham:—

Mr. Stewart keeps about 1,000 ewes, half comebacks and half coarse cross-breds. The comebacks are mated with Border Leicester rams and the coarse ewes with Shropshire rams.

The comeback ewes lamb earliest, the coarse ewes later, but Mr. Stewart is convinced that late lambing (about September in his district) lessens

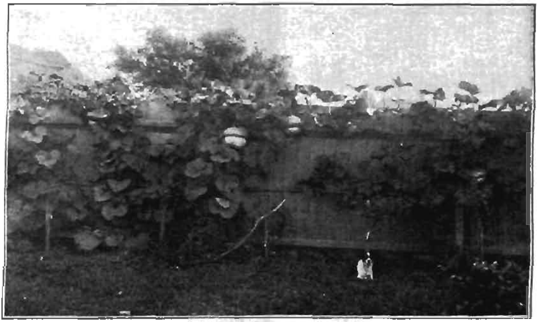
the chance of the lambs getting a check. They come when he has plenty of spring feed, as well as in the warmer weather. Mr. Mountjoy, who is a neighbour of Mr. Stewart's, and goes in mainly for wool growing, also believes in late lambing.

Mr. Stewart's coarse cross-bred ewes are a splendid class of ewe for raising export lambs from. His fine comeback ewes, being mated with the Leicester rams, give him good wether lambs, and he finds it profitable to hold the best ewe lambs over for future breeding.

Four Shropshire and three Border Leicester rams are in use on this farm. They are level made sturdy looking sheep all on the one pattern in shape, irrespective of their breed. The lambs by the Shropshire rams were the best when handled at the time of visit, in January, but the fact that these had the best framed mothers must be taken into account.

GROWING PUMPKINS ON FENCE.

The accompanying illustration shows how pumpkins, melons, and vegetable marrows may be grown on a fence where ground space is not available. A section only of the pumpkins, &c., grown in this way by Mr. A. B. Weire, Bay-road, Sandringham, is included in the view, but the



total weight of the four Turks' Caps visible is between 40 and 50 lbs. Two seasons ago a pumpkin weighing over 1 cwt. was grown in the same manner.

THE STINKING SMUT OF WHEAT.

D. McAlpine, Vegetable Pathologist.

I.—Answers to Questions.

In my forthcoming work on *The Smuts of Australia* there will be a full account of the various smuts which attack cereals as well as other plants, together with the best methods of treatment. The stinking smut of wheat holds a prominent place on account of its special economic importance, and I have selected for publication a portion of the work dealing with the answers to a number of questions which the farmer naturally puts to himself.

Now that the sowing season will soon be on, it is important that he should know the essential points in connexion with this smut in order that he may take the necessary precautions to insure his crop being free from the disease.

This particular smut has been treated at some length, because it is the form with which the farmer is most familiar and it appeals to him as the type of smuts in general. Therefore it has been deemed advisable, by way of summary, to conclude by clearly stating a number of questions which he consciously or unconsciously asks himself, and answering them as far as observation and experiment will permit.

It is of fundamental importance for him to realize at the outset that the smut plant is a fungus which develops from spores that are the equivalent of seeds in other plants, and that this plant grows as a parasite within the wheat plant until it reaches the grain and there produces its fruit or masses of spores (ball smut) similar to those from which it started. In order to grow and develop properly, this smut planr is dependent on surrounding conditions, just as much as the wheat-plant itself, and if we understood those conditions, it would explain why the spores sometimes germinate and sometimes do not, why the smut plant sometimes reaches maturity and forms its spores and sometimes does not, just as the seed-wheat may or may not germinate and the seedling may or may not reach maturity.

It is also of prime importance to remember that the wheat is only infected in the seedling stage, just as the young plant emerges from the seed beneath the surface of the soil. Consequently, no infection can come through the air, unless indeed the grain germinates upon the surface of the ground and when it is properly planted only the spores adhering to the seed can produce the disease. The farmer sometimes sees or fancies he sees smut spores upon his fences and when he has treated his wheat after a fashion and the smut still appears, he tells you that it was blown from the fences. But when the wheat plant is above ground, it is proof against infection from bunt spores, so that there must be some other reason for the failure of the treatment.

There are questions sometimes put by the farmer, however, which cannot receive a definite answer, because his experience does not always take note of the accompanying conditions and because his love of paradox sometimes overrides his experience. I am often asked by farmers, "Why is one part of a paddock of wheat smutted and the other not, the seed in each case being treated properly and sown at the same time?" It all depends here on what is meant by proper treatment of the seed, as it is implied by the question that the fault must lie in the soil. But it is found by experiment that when the seed is properly treated with bluestone

although spores of the smut may be in the soil from a previous crop or from self-sown wheat. Then the farmer almost invariably upsets any answer you may give by adding that the next season things were reversed, the clean part of the paddock being smutted and the other not, even with the aforesaid proper treatment. Bearing in mind that there is no fungus disease known which can be more readily or more absolutely prevented than this smut, we will now propound a few of the questions which arise in connexion with it.

First of all we may state definitely that the smuts of wheat, oats, and barley are not the same. No, they are quite distinct; for the smut of wheat cannot infect oats or barley, nor can the smut of oats or barley infect each other or the wheat.

1. *Why does bunt sometimes appear in a paddock when the seed is supposed to be properly treated?*

This may be due to various causes, such as returning the treated grain to bags which have not been disinfected and thus re-infecting the grain, or sowing the seed with a drill which has not been properly cleaned. It may be, however, that the smut-balls had not been skimmed off in the process of pickling and being crushed in the drill the seed is infected.

2. *Will the bunt spread from one paddock to another, or from one plant to another, like the rust, when the crop is growing?*

Since infection occurs in the seedling stage only and the germ-tubes penetrate at the point where stooling occurs, and that is beneath the ground when the grain is covered with earth, there is no possibility of the disease spreading from one growing plant to another.

3. *Should seed-wheat be used from a crop known to be bunted?*

Decidedly not, for there is a strong probability that the grain will not be so plump as if perfectly healthy. A crop may have but comparatively few actually smutted ears and yet give a much reduced yield and a poor quality of wheat, because the smut was in the straw and affected the yield, although it did not reach the ears before maturity of the grain.

4. *Will spores lying on or in the ground from last year's crop infect the next?*

This question of infection from the soil often crops up, but since it was found by repeated experiments that properly treated grain, even although grown on very smutty ground, was free, it may be concluded that soil-infection practically does not exist. I say practically because there is a possibility of stray infection taking place when there are numerous spores around the germ end of the seed where the young plant bursts through.

5. *May bunt originate from self-sown wheat?*

Self-sown wheat is rarely affected by bunt; still it may occur in some seasons. I have usually seen self-sown crops perfectly free and have also found a little, but not in sufficient quantity to injure the sale of the wheat. It is generally stated that it is the heat of the sun in summer which kills the bunt spores on self-sown wheat; but Farrer showed that the rains and the dews may also cause the spores to germinate and having no germinating wheat plants to penetrate, they soon perish. The heat of the sun and the dews at night are likely to prevent the appearance of bunt in a self-sown crop, but if the interval between the harvesting of the crop and the sowing of the next, as well as between the ploughing of the land and the seeding is short together with cool and dry weather, there may be some danger of infection. In the early days many farmers used to expose on a cloth the wheat intended for next year's seed. They found that the weather—dews, sunlight, and hot dry winds—acting on the seed for a period of several weeks, killed the spores, or rather they discovered

6. *Why is there more bunt from the same seed in one paddock than another?*

There may be various reasons for this. The land may be fallowed in the one case and not in the other. It may also be more moist in one paddock and thus favour the germination of the spores at seeding time. Actually wet soil would be inimical to germination. Whatever delays the first growth of the wheat plant will be favorable to the increase of bunt.

7. *Does the date of seeding influence the amount of bunt in the crop?*

Different conditions at seeding time are likely to affect the result, but I have no definite experiments with regard to bunt which show it. I carried out an experiment with flag smut which shows that the date of sowing has a very decided influence. The seed was purposely sown on 24th April and 16th July, or nearly three months between, on land that had borne a crop badly affected with flag smut the previous season. The first was sown when the ground was dry, but there seems to have been no germination until the rain came, which germinated both the seed and the smut, for there were up to 14 per cent. of diseased plants. The later sown was about a month after the rain and the ground was in excellent order, but the spores had evidently germinated and perished in the interval, for there was only about 1 per cent. affected.

It does not necessarily follow that this would apply to bunt, but the weather and soil conditions enter so much into the result, that a dry or a wet seed bed at the time of sowing, or a spell of warmth or of frost at the time of germination, is bound to make a difference.

8. *Why are some varieties more liable to bunt than others?*

As afterwards more fully discussed, this may be due to the fact that the least liable variety germinates so rapidly that the smut plant is unable to reach the growing point of the wheat and so dies, or there may be something in the tissue of the variety unsuitable to the growth of the fungus and so the variety is said to have the hereditary or inherent quality of bunt resistance!

9. *When all the grains are equally inoculated with spores, why are some plants bunted and others not?*

It is quite a common occurrence for inoculated seed to be sown under similar conditions and yet a number of the plants escape infection. It is not easy to answer the question, but a few considerations may help in this direction. First of all, the young seedling must be at the right stage of growth in order that the germ tube of the fungus may penetrate and this period is of a very short duration. Next, the germ-tube must grow and reach the growing point, or it would not be able to develop and produce the disease. But the main reason for some plants being attacked and others not, lies in the fact that there are certain substances known as chemotactic substances in the plant which favour the entrance of the germ-tube of the fungus and its development inside. There are also substances which actually repel the germ-tubes and it is the presence or absence of these which determines whether an individual plant will be attacked or escape. The seed from plants, however, which escaped infection in one season have been sown the next and found to succumb.

10. *Why are some plants partially bunted—only some of the ears being affected and not all?*

It often happens that only the secondary or late ears are affected, the others being clean, and this might arise from the fungus filaments at the base of the plant only reaching the growing point of the slow and late developing plants, while the others escaped. In other cases where the fully

developed ears were bunted, the germ-tube had evidently reached the growing point of the seedling and the mycelium had kept pace with the growing plant.

11. *Why are some ears only partially bunted?*

Under ordinary conditions the whole of the grains in an ear are affected, but in certain seasons it is not unusual to find ears in which the grain is partially bunted and partially clean. It may be that one side of the ear has escaped, but usually the sound grains are interspersed among the bunted. In one case the lower grains were all bunted, then about the middle an occasional one was clean, and at the top both smutted and sound occurred, the topmost grain, however, being diseased. The normal condition is that all the grains in an ear are attacked, and when some escape it can only be owing to the spore-bearing hyphæ failing to reach these particular grains. It might be thought that the grains which escape the invasion of the fungus to form spores, had some resisting power, but when the clean grains in a partially bunted ear were infected and sown, they produced bunty plants, showing that there was nothing in the grain itself to account for its escape.

12. *Why are some grains of wheat only partially bunted?*

This was a comparatively rare occurrence, only appearing in one ear of the variety known as Cedar grown at Dookie, and in one ear of Genoa grown at Burnley. In the latter ear there was only one grain partially bunted, three entirely bunted, and all the rest free. In the partially bunted grain the fungus had evidently exhausted itself in producing its spores only on one side, and why the whole of the starch was not utilized in the formation of spores, might be due to the slow growth of the fungus, enabling the contents of the grain to harden so that it could not penetrate. In fact, in all these cases, whether it is smutted and sound plants on the same stool, or smutted and sound grains in the same ear, or even when the grains are only partially smutted, the explanation is the same, that by some accident of growth the fungus did not undergo its full development, and was unable to reach all parts of the plant as usual.

II.—Treatment of Stinking Smut of Wheat.

Since it has been clearly shown that this smut is reproduced from spores, it is evident that if the spores can be destroyed or their germination prevented, the smut itself will not appear, and it is on this principle that the direct treatment for smut is based. In the case of this smut, where the spores adhere to the grain and infection occurs in the young seedling, all that is necessary is to treat the grain with some substance which, while harmless to the grain, will destroy or prevent the germination of the spores.

Quite a number of substances have been used for this purpose and found more or less effectual, but there are only two which are generally used by farmers in Australia on account of their ease of application and comparative cheapness, and that is, first, a solution of sulphate of copper or bluestone, and second, formaldehyde, the trade name of which is formalin.

All methods of seed treatment known depend for their success to a large extent on the precautions taken to prevent re-infection after dipping. Careless farmers put the pickled grain into smut-infested bags or omit to clean the drill. If the seed-box contains bunt balls or spores of the smut, the treated seed will be in part at least affected.

Bluestone Treatment.

This is the one most commonly used here, and consists in making a solution at the rate of 1 lb. of bluestone to 5 gallons of water, or a 2 per cent. solution. The seed is then placed in sacks and immersed in this solution until

every individual grain is wetted, and that only takes about a minute, and should not exceed it. The constant shaking and stirring of the grain while being immersed should bring all bunt-balls to the surface, and these should be skimmed off. The bag is then allowed to drain, and when dry the seed is ready for sowing. It is to be noted that the solution of bluestone is always of the same strength as when first prepared, no matter how much of it has been used up in dipping or in coating the grain. It becomes of course reduced in quantity, and if exposed to the hot sun for several days, it would become more concentrated, but under ordinary circumstances the standard solution remains constant in its proportion of bluestone to water.

FORMALIN TREATMENT.*

Formalin or formol is the trade name given to a solution in water of a colourless pungent gas known as formaldehyde, and the solution ordinarily used contains 36 to 40 per cent. of the gas. One pound of formalin (16 ozs. avoirdupois) of the above strength is added to 40 gallons of water and the seed is immersed in this solution for five minutes, shaking and moving it about sufficiently to insure the wetting of all the grains. The bunt-balls are also skimmed off as before.

Formalin is a well-known antiseptic, disinfectant, and preservative, and is extensively and most satisfactorily used for the treatment of stinking smut in both the United States and Canada. From its less corrosive action on the seed and the higher percentage of germination which it yields, it has certain advantages over bluestone, and if the seed is sown within 24 hours of treatment in a soil sufficiently moist to insure germination, the freedom of the resulting crop from bunt is assured.

I recommend dipping the seed, because it enables one, by thoroughly shaking and stirring, to wet every grain and at the same time to skim off the smut balls; but it may also be pickled on the barn floor by sprinkling the solution over it and thoroughly turning the seed until all the grains are wetted. In addition to dipping and sprinkling, the seed may also be treated by special machines made for the purpose.

Bearing in mind that the proper treatment is to wet every grain and skim off the smut-balls, there is one machine known as a Smut Cleaner which performs its work very satisfactorily. It consists of a frame made of carefully selected hardwood; a tank made of the very best galvanized iron, when formalin is to be used, or of copper for bluestone; and a hopper in which the seed is placed. There is also an elevator to elevate the grain from the tank after treatment, and an automatic skimmer which sweeps everything from the top of the solution over the back of the machine.

The wheat to be treated is placed in the hopper, then it drops into the solution in the treating tank, the solution being kept in constant motion by the elevator carriers and skimmer, so that every grain is wetted and the smut-balls and light seeds skimmed off. The treated seed is thus taken up from the bottom of the tank and carried over a strainer sieve, where it is thoroughly drained and then deposited in a bag in front of the machine.

However the grain is treated, whether by dipping or by means of a special machine, if done thoroughly and with the right strength of solution, the farmer is insured against loss from one of the most destructive yet most easily treated of smuts.

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* By the new industry of wood distillation Messrs. Cuming, Smith, and Co. are producing formalin at Warburton, and can provide 1-lb. bottles of 40 per cent. strength (same as Schering's) at 1s. 6d. per lb packages free.—D. McA.

IRRIGATION IN EASTERN SPAIN.

F. de Castella, Government Viticulturist.

Though my mission was a viticultural one and it was in connexion with the vine that I visited Valencia and its neighbourhood. no description of agricultural development in the rich region of the Levante could be attempted without reference to irrigation; for this is one of the portions of Europe where the natural water supply has been turned to best advantage and where irrigation practised during many centuries in a remarkably enlightened manner has rendered it one of the richest and most productive parts of the Peninsula.

The efficiency of irrigation and cultural methods, the variety of products raised, the density of population, and last but not least, the similarity of the climate to that of the greater part of Victoria were facts which impressed me vividly. The necessarily incomplete notes which follow can give, I fear, but an inadequate idea of the impression created on me by a region which is generally considered to be an object lesson in irrigation.

I have already referred to the orographical structure of the eastern coast of Spain and the distribution of the land fit for cultivation along a strip of variable width between the sea and the inland plateau with its high flanking rocky hills. Here and there, are patches of rich, level, alluvial soil. These are of greater extent near the mouth of a river or creek and, if the river be of any size and sufficient water available, advantage is taken of it and one finds an irrigated plain or *huerta*—this being the Spanish equivalent of garden. We have thus several distinct irrigation areas. Each is complete in itself, and though presenting individual peculiarities as regards the arrangement and amount of waters, and even as regards water laws and regulations, the methods of culture, based as they are on long experience, are similar.

The Huerta de Valencia or wide irrigated plain surrounding the town of that name is one of the most interesting of these. In spite of its antiquity it has served as a model for many a modern scheme and has been the objective of missions for hydraulic engineers and agriculturists from many different lands. That its works should have survived unchanged throughout the long centuries of turbulent mediæval times is remarkable. They appear to have been always respected by combatants and, though wars and revolutions have time and again devastated the country, the channels and headworks remain unchanged—a striking testimony to that strange Moorish race which for several centuries occupied a large portion of the Peninsula bringing with it progressive ideas in the arts of peace as well as of war, and which have had such a considerable influence on Spanish civilization and more particularly on its agriculture.

Though naturally much impressed by what I saw, I had some doubts lest the Spaniards whom I met, and with whom I discussed the matter, might not, through a very pardonable pride in one of the remarkable features of their country, have led me to take an exaggerated view of the efficiency of their irrigation methods; for these considerations belong to the domain of the hydraulic engineer rather than the viticulturist.

Desirous of forming a correct opinion on these points, I consulted the Chairman of our State Rivers and Water Supply Commission, Mr. Elwood Mead, who informs me that the importance and efficiency of irrigation methods in these parts is very generally recognised, and that the

high esteem in which the Spaniards hold them is not misplaced. He very kindly supplied me with literature on the subject from which I have made a few quotations. In his Third Biennial Report (1895-6) to the Governor of the State of Wyoming Mr. Mead, then Engineer for that State, writes as follows:—

The European country which most nearly resembles ours (State of Wyoming) is Spain. Its rainfall is less than that of Wyoming, hence irrigation is indispensable. Spain is also the country which best repays study, since its code of water laws is both the most concise and the most complete of any country in the world where irrigation is largely practised.

These laws are the outcome of the experience of a thousand years in which local laws and customs, widely different in character, have operated side by side in the same province.*

The most impressive of these lessons, both to Spain and to the people of this country, is afforded by the experience of the province of Valencia. The plain near the city of that name is one of the oldest and most celebrated irrigation districts in Spain. . . . . The prosperity of its people and the success of its institutions have been admired and commended by every writer, and all agree that they rest on the inseparability of land and water.

Mr. Mead deals at length with the relations existing between land and water. He contrasts the prosperity of Valencia, where the water is attached to the land, with the less satisfactory conditions at Elche and several irrigation areas further south, where the water is owned separately and sold to land-holders.

From *Irrigation Development*, a standard work by Mr. Wm. Ham Hall, State Engineer for California, the following quotations relating to Spanish irrigation are of interest. Speaking of Valencia on page 383 he says—

The Huerta or garden plain of the city of Valencia constitutes one of the oldest and, justly, most celebrated irrigation districts of Spain. Its works date from the time of the Moors; its water rights are founded on custom which antidates existing property records in the country; and its irrigation practice and regulation are the outgrowth of centuries of experience unfettered by regulative laws or administrative action other than those local and self imposed by the irrigators. . . .

The Huerta of Valencia is on a plain 7 to 9 miles in width, gently sloping from the foot of the Sierra Molino Mountains to the sea on the eastern coast of Spain. This garden plain comprises about 26,350 acres of irrigated land, supplied by the waters of the Turia River, through eight main canals and their distributaries; and in the midst stands the city of Valencia. The property is for the most part minutely subdivided in ownership, and is held by peasant proprietors or the hereditary tenants of wealthy owners.

"The population of the whole province of Valencia is 120 per square mile, but in the irrigated portions it is vastly more, and in the 26,000 acres watered by the eight canals of the Turia there are 62 villages containing a population of not less than 72,209 souls; that is, at the rate of 1.774 per square mile; and this includes no part of the city of Valencia."—(Moncrieff, p. 128.)

The Turia is a torrential river with a width of 200 to 400 feet through the plain, over a shifting bottom, and with a much less width, over a cobble and gravel bed, where it emerges from the foothills of the mountain. Its floods, rising 15 to 20 feet, were at one time a devastating agent to the city and its surroundings, but levees now keep these waters to their proper course. Its low water discharge is 250 to 350 cubic feet per second, which is all taken up by the canals for irrigation.

The eight canal headworks are placed four on each side of the river, alternating and not opposite to each other, about equidistant apart, and within a length of 3.2 miles of the river channel; the highest being 5 miles from the city and the lowest 2 miles distant.

*Old irrigated Spain, therefore, never was subjected to feudal rulers; and as a consequence, we find there no great water holdings, like in Italy, oppressing the people and resulting in monopoly of land, but, on the contrary, we find the waters attached to the lands, the lands held in small parcels, and the people an independent peasantry.—(Hall's *Irrigation Development*, page 366.)

These headworks are small but massive masonry structures, each with two sliding gates of sizes—proportioned to their rights—from $3\frac{1}{2}$ to 7 feet in width. To each headwork is a dam of masonry across the river channel, whose crest and length of overfall is so regulated, with respect to the elevation and width of the sill of the canal gates, as approximately, to divert the proper proportion of the waters into the canal without the necessity of manipulating the gates for every small variation in the river's flow. . . . . .

"All these weirs date from the time of the Moors, and nothing is certainly known as to their foundation, but tradition says that the solid masonry is carried down 13 to 17 feet below the river bed, and that it rests upon piles, the heads of which are embedded in masonry."—(Aymard, p. 20.)

Interesting details follow as to the apportionment of water which i often made—

In terms of a unit of measure whose real volume is indefinite. This unit is called a "thread of water," and the volume of the stream when all in use is divided into 138 "threads," each canal taking its proportionate part of the whole according to a fixed schedule.

This system was frequently followed in other parts of Spain as well as in Algeria.

By this system of proportionality each one enjoys abundance of water or suffers from scarcity in the ratio of his interest to the whole.—(Aymard, pp. 24-25.)

This, however, was over 40 years ago and Mr. Hall goes on to say that—

there were even then many irrigation works throughout other parts of the country which were due to the modern Spaniards, and where water was divided by measurements of volume.

Mr. Hall then deals with Irrigation legislation and administration. He quotes Mr. Scott Moncrieff, who considers the latter—

"to be well worthy of study. Here more than in France or Italy, government by a representative Assembly is fully carried out, and has been for more than 600 years, with the best results."—(Moncrieff, p. 136.)

Full particulars of curious local systems of administration and control are given at length—Tribunal of waters, syndic labourers, &c. These extracts will suffice to show the efficiency of irrigation in this part of Spain.

Concerning the district of Jucar, immediately south of Valencia, he writes—

The Jucar River, like the Turia, rises in the Sierra Molino Mountains, and . . . waters the district immediately south of the Huerta de Valencia, making with it and the district of Murviedro (now called Sagunto), immediately on the north a continuously irrigated garden land near 40 miles in length. The Royal Jucar Canal . . . has a length of about 26 miles. . . . The very massive dam, headworks, regulating gates, and main outlet structures are all of cut stone masonry, and the gates are generally moved by screws. The area of irrigation is about 50,000 acres, the cultivation is principally that of rice, the waters are often used over the third time, and the system is so perfect that but little waste is suffered, but the supply of water is abundant and the use extravagant.

It will no doubt come as a surprise to many to know that to a certain extent our own water laws are based on those of Spain. Mr. Stuart Murray, late Chief Engineer of Victorian Water Supply, in reply to some queries as to whether there were not some references to Spanish irrigation methods in the reports published some years ago by the Water Supply Department writes—

I do not think there is any report issued by the Water Supply Department containing direct reference to irrigation in Spain; at all events any reference that would be likely to be useful for your purpose. There are references to the Spanish law affecting rights in water and to the administration of the law in Spain. . . . Part II., sections 4-24 of the existing Victorian law, *Water Act* 1905, is based, in great measure, on the Spanish Law of Waters; although of course, no reference appears either in the text or marginal notes.

Mr. Murray further refers me to the work of Mr. W. H. Hall from which quotations appear above as well as the work of Sir Colin S. Moncrieff concerning which he says—

The results obtained by irrigation in Valencia are there favorably spoken of and held up as a motive to our irrigators.

On 13th January, 1908, I arrived at Valencia, the capital of the province of the same name, which, together with the adjoining ones of Castellón, Alicante and Murcia, constitute the agricultural region of the Levante. Valencia is the most important of the four and when one considers what a large portion of its surface consists of barren hills the fertility of the irrigable portion is but more evident.

IRRIGATING OLIVES AND VINES NEAR SAGUNTO.

The railway journey from Barcelona to Valencia is a most interesting and varied one. The Ebro, the fine river I have several times referred to in connexion with Navarra, Aragon and La Rioja, is crossed near Tortosa, the railway line running inland for some distance to avoid the low lying, swampy lands of the delta. Near Tortosa, an unusual sight meets the eye in the shape of large rice fields, for this is the chief rice producing region of Spain. The total area in that country under rice in 1906 was 90,750 acres; of this 70,750 acres were situated in the province of Valencia. In 1906, the Valencia rice fields yielded 3½ million cwt. of rice or an average yield of 50 cwt. per acre.

Many fruit trees are to be seen near the river, but though fruit is largely grown in the Levante, and especially in the irrigated areas, one seldom sees a large orchard according to Australian ideas. Mixed farming is the rule and each small farmer grows a few fruit trees in rows amongst his other crops. Occasionally, a block planted exclusively with fruit trees is to be seen but, except in the case of orange groves, it is rather the exception than the rule. Higher up in the hills, where the climate is cooler, apple and pear orchards are to be seen but here the fruit trees are in small patches and much mixed. Peaches and apricots are extensively grown, though the former are apt to suffer considerably from fruit fly in some seasons. Thus the line continues, the

view from the carriage window being remarkable for its variety—dry stony patches devoted, as has been explained elsewhere, to deep rooting plants such as the vine, the olive, the almond, and the algarrobo, alternating with irrigated Huertas with their almost endless variety of products.

Intermediate between the two are fields devoted to the culture of cereals, for the province of Valencia possessed, in 1906, 86,000 acres under wheat, of which 56,000 were irrigated, 10,000 acres under oats, and over 25,000 acres under barley, the last two being almost exclusively grown on unirrigated land. It is, however, Castellón and Murcia, more especially the latter, which are the principal wheat producing provinces in the Levante in which region 516,000 acres were sown in 1906 yielding nearly 7,000,000 bushels of wheat. The 56,000 acres of irrigated wheat in the province of Valencia yielded, in 1906, a little over 2,000,000 bushels, or an average of over 35 bushels per acre.

ROMAN THEATRE AT SAGUNTO (MURVIEDRO).

The region is a beautiful and attractive one but one which oddly enough appears to have so far remained almost undiscovered by tourists. This seems strange, as for climatic advantages and varied interest it has quite as much to recommend it as the far famed Riviera in S.-E. France. At Sagunto, one finds the Saguntum of the ancients, the scene of the celebrated siege by Hannibal which led to the second Punic war. The castle is situated on a high hill, close to the village, and, though little remains of the walls which existed in Hannibal's time, owing to fierce fighting and much rebuilding by Romans, Moors, and Christians, and more recently still by the French under Napoleon, it is an historical monument of deep interest. It has for many years been known as Murviedro, but a slight modification of the original name has recently been reverted to. Among its many relics of great antiquity is a very fine Roman theatre in very good state of preservation of which a photograph is here reproduced. On the lower land between the castle and the sea are large plantations of olives and vineyards, remarkable as being an exception to the usual rule of limiting these crops to dry unirrigable lands. The photograph shows olives and vines being submitted to winter irrigation, an unusual sight in the region.

About a dozen miles more and one arrives at Valencia del Cid, to give it its full title. The approach to the town is heralded by the numerous characteristic cottages or rather cabins of the farmers known as *Barracas* which are quite different from what is to be seen in any other part of Spain. The two photographs reproduced will give an

A "BARRACA" (PEASANT'S COTTAGE).

idea of these queer high gabled, whitewashed huts with their scanty windows and thatched roofs, a relic of the Moors who have left abundant traces of their occupation in this portion of Spain.

Valencia is a handsome town of 220,000 inhabitants; it is, in fact, the third town in Spain and possesses many historical monuments, most of which are distinctly Moorish. One of the most interesting of these, from an agricultural point of view, is the Lonja de la Seda or silk exchange, which, with its spiral columns and high vaulted ceiling of hard marble like limestone, remains to-day almost exactly as it was at the

BARRACAS NEAR VALENCIA.

time of the Moorish occupation. Silk production and manufacture are important industries in Valencia at the present day; last year's prices were very satisfactory to producers.

The morning following my arrival I called on H.B.M. Vice-Consul, Mr. E. Harker, to whom I had a letter of introduction and who received me most warmly. It is to him that I am indebted for introductions which enabled me to see something of the lexia raisin industry of Denia, a description of which appeared in the January number of the *Journal*. Being directly interested in the preserved fruit and also in the raisin trade, he was in a position to give me much valuable assistance and advice, which he most freely did. I take this opportunity of tendering him my sincere thanks.

Fruit canning and pulping are important industries in Valencia. The former has undergone some modification of late, owing to the Chicago scare and the prejudice which resulted in England against tinned fruit. Much fruit is now put up in Spain in large tins and transferred after its arrival in London to glass jars.

THE ESCUELA PRATICA DE AGRICULTURA.

Together with Dr. Edouardo Bosca, one of the professors at the Valencia University, to whom I also had a letter of introduction, I visited the Escuela Practica de Agricultura (practical school of agriculture) situated at Burjasot, just outside the town of Valencia. The school is under the direction of Don Dr. José Maria Marti to whom I have already had occasion to refer. He was absent on my first visit but I was fortunately able to meet him on my return to Valencia from Denia.

It has already been stated that the Spanish peasant in the irrigated areas has attained a high state of proficiency in the working of his holding. This is no doubt true, but his methods are often old fashioned. They have as a rule been handed down from previous generations and though, owing to thoroughness, good results are usually obtained, even better are to be looked for from the infusion of knowledge of modern scientific developments in agriculture. The Government of Spain has recognised this fact for some time and, more especially of late, it is doing good work in the way of experimental work and the dissemination of up-to-date agricultural information.

The Escuela at Burjasot performs both functions. Until recently it was what is known as a Granja Instituto de Agricultura (experimental farm); it was converted into a practical school by Royal decree of 4th January, 1907. This establishment is not an agricultural college. It is essentially an experimental station where labourers and sons of small farmers can without great pecuniary sacrifice receive practical instruction such as will enable them to better work their holdings. The students are practical agriculturists of the neighbourhood. They perform the work of the place and are paid at the rate of 1.75 pesetas (1s. 5½d.) per day from which 1 peseta (10d.) is deducted for their keep. The instruction given to these labourer students is mainly practical, though a few lectures are also delivered—the course lasts twelve months. A higher course, both practical and theoretical, is also given to qualify students for positions of capataz (overseer) on large estates.

In addition to this regular work special short courses are given as follows :—

Courses of about three months' duration in connexion with some special form of agriculture to students who receive no pay.

Short courses to soldiers in barracks, a small number of whom are taken at a time, for four days a week, in rotation.

During the holidays special courses are given to State school teachers to qualify them to give lessons on agricultural subjects in their schools.

Sericulture receives a good deal of attention, and I saw several students, attending a special course in this branch, engaged in the rearing of disease-free seed (eggs).

Nor is viticulture overlooked, though, as has been pointed out, the vine does not figure to any extent in the rich irrigable land—this school was mainly established for the education of irrigationists, the main viticultural branch being under the control of Don Rafael Janini y Janini as has been already described. Nevertheless at Burjasot there are some experimental vine plots and collections.

New fodder plants are being largely tried. Two of these struck me as being worthy of note. One was a form of lucerne, called Mielga, said to be more hardy than the ordinary lucerne or alfalfa, as it is known in Spain. Two plants closely allied to the ordinary globe artichoke, viz., *Cyanara scolymus* and *C. cardunculus* usually grown as table vegetables were recommended to me as worthy of cultivation as fodder plants in dry situations. Endeavours are being made to encourage the cultivation of hemp, which, at one time, was largely grown but has for some reason or other been neglected of late. In reply to a question I was informed that flax is not at all cultivated in the Levante, hemp having been found a far more profitable crop. In addition to instruction, lectures, &c., in the Escuela, the staff are at all times willing to give advice to farmers in the district, and to conduct analyses of soils, manures, &c., for them.

It will be seen that the Escuela has a great variety of duties to perform. It appears to be doing good work in the dissemination of agricultural knowledge. Though at first it encountered much apathy and had difficulty in recruiting students, these are now presenting themselves freely and local interest is being manifested in the work of the establishment.

DIVERSITY OF PRODUCTS GROWN.

The variety of crops raised on the irrigated land is most striking. I regret that the official Spanish statistics in my possession only refer to vines, olives and cereals. Concerning most irrigation products I have unfortunately no figures, but one cannot visit the region without being struck by the variety of crops grown. Its general prosperity bears testimony to the remunerative nature of the results obtained.

In the Huertas, specialization is no longer the general rule. In less favoured situation many circumstances have to be contended against, and one product usually stands out as pre-eminently suited to a certain locality. It is found possible to produce it in sufficient quantity and in a high degree of perfection. The result is the specialization which I have frequently had occasion to refer to. In connexion with vine culture it is especially noticeable, the products of the vine depending so largely for their profitable sales on their quality.

This no longer applies in the rich irrigated lands where most plants thrive equally well, and quantity rather than quality is the aim of the grower. Such factors as the extreme subdivision of the land, the need for rotation of crops, and the large consumption of vegetables and fruit in Spanish households, have combined to make each holding rather a garden than a farm. An extreme form of mixed farming is thus a striking feature of the irrigated lands.

So numerous are the crops grown on each holding that it is difficult to know which is first in importance. The orange certainly occupies

a high place. So profitable were the results obtained a few years ago that over plantation has resulted, to which last season's low prices are no doubt largely due. But the orange has been dealt with elsewhere, and, owing to its permanent occupation of the land, it can scarcely be considered in the same light as the numerous annual crops the relative importance of which often varies from one season to another. The same remarks apply to fruit trees and white mulberries (for silkworms) which are everywhere in evidence, though rarely in regular plantations. The quantity of fruit grown near Valencia is very considerable, a large proportion of it being exported.

FODDER CROPS of various kinds are very largely raised, chief amongst which are lucerne, maize, and beans; of the latter, a great number of varieties are cultivated for the beans they yield, for fodder, and for green manuring. As my visit took place near the winter, there was little to be seen of lucerne or maize culture, but beans were very much in evidence. Onions enter largely into the human food supply of Spain, and in Valencia they are raised in enormous quantities for export as well as for home consumption; large quantities are shipped to England.

The TOMATO is another most important product. The Spanish cook would be quite lost without tomatoes, the consumption of which in the country is enormous. The area devoted to this culture is correspondingly large, and the profits realized are heavy. The little I was able to see of tomato and onion culture can be better described in connexion with my visit to Gandia some 30 miles south of Valencia. In Andalucia, I have seen tomatoes which, gathered on the unripe side, and hung up in a dry place, kept in good order right through the winter. I secured seeds of this variety which, sown since my return, have produced plants now bearing fine fruit, the keeping properties of which I propose to test. A large proportion of the tomatoes grown in Eastern Spain is exported to other parts of Europe, both preserved and in the fresh state.

All the usual kitchen vegetables are grown in great abundance, as well as potatoes. I do not think there is an edible vegetable known to us in Australia which is not largely cultivated, and in addition one meets with some which we usually look upon as curiosities rather than as regular articles of diet such as they are in Spain. Among those which interested me most are the egg plant (*Solanum melongena*). This botanical relation of the tomato, called in Spanish *berengena*, though not unknown to us, is not cultivated nearly so extensively as it merits. In Mediterranean countries it supplies enormous quantities of excellent, wholesome food for rich and poor. A visit to the market in any town in Spain or Southern France, when this fruit is in season, is convincing as to the esteem in which it is held. It is the large purple variety which is generally preferred. Cooked in various way it constitutes a most palatable vegetable, meriting more attention than it receives with us.

CAPSICUMS OR CHILLIES (*Pimiento* in Spanish).—Various sorts are to be met with. The large mild ones are held in great favour, and enter largely into the every day bill of fare. Cut into quarters and stewed in stock, they constitute a most palatable, though novel vegetable. Dried and ground into a coarse, cayenne pepper-like powder called pimentón they constitute a sort of spice much used in Spanish cookery for colouring and flavouring stews and other dishes. In many parts of the country the fronts of the cottages are almost hidden in autumn by long streamers composed of these large mild capsicum threaded on strings and drying in the sun to be subsequently ground into pimentón.

SAFFRON is another plant in request with Spanish cooks for colouring purposes, and is largely cultivated, especially in some of the upper valleys where it sometimes becomes a special culture, as at Requena and some other villages on the railway line to Utiel. Near that town I remarked fields of this plant, easily distinguished by its curious foliage which reminds one of the grape hyacinth.

MELONS of various kinds are largely consumed in Spain, especially the *Valenciano* or Valencia melon of which several varieties exist. These melons are dark green outside with firm, sweet, white flesh. They are very wholesome and stated not to disagree with children even. It is strange that these melons should be practically unknown to us. They constitute an important article of food in Spain. They ripen late and can be kept through the greater part of the winter.

Many other crops are to be met with sometimes on a fairly large scale, such as sweet potatoes, peanuts, &c., nor must we omit the ubiquitous bamboo, which is largely planted as a breakwind, in whch form it constitutes one of the features of the landscape. The cut canes come in most useful for many purposes in a country so devoid of timber as Spain has the misfortune to be.

Such is a brief sketch of a few of the plants cultivated. It is well for us to remember that there is not a single one of these which will not thrive equally well with us, more especially in our irrigation areas.

MANURING AND ROTATION OF CROPS.

A lesson the Valenciano farmer has long since learnt is the value of manure. In the irrigated lands especially, this has long been widely recognised and of late years an enormous demand has sprung up for artificial fertilizers, Spanish, English, and German firms, as well as local factories, competing for the custom of the cultivators. It is a fatal mistake to think that irrigation lessens the need for manuring or that it can act as a substitute for it in any way. The very reverse is the case. Irrigation, by enabling the plant to grow more vigorously and yield more heavily, also enables it to remove more plant food from the soil and therefore hastens its exhaustion, unless restitution in the shape of manuring, be made. The large trade done in artificial manures in Valencia and the surrounding districts is eloquent testimony of the truth of the above. The use of artificial manures has been a powerful aid to production and, supplementing the inadequate supply of ordinary manure, has contributed in a very large degree to the present prosperity of the region.

Some idea of the quantities usually applied will be given by the following formula of artificial manures applied to an experimental rice field on which different varieties were being tested. The experiment was carried out by the Granja, the quantities of manures being those usual for rice culture in the district. These quantities were as follows:—

FIRST APPLICATION (22ND JUNE).

	lbs. per acre.
Sulphate of Ammonia (19 per cent. nitrogen)	356·4
Superphosphate of Lime (16·8 per cent. soluble phosphoric acid) ...	396·
Sulphate of Potash (49·48 per cent. potash)	39·6

SECOND APPLICATION (14TH JULY).

One-sixth of the first application.

No doubt the soils of the Huertas are ideal ones for the use of artificial manures, owing to the large proportion of humus they contain. This peculiarity is the result of hundreds, perhaps thousands, of years of continuous cultivation, during which all available manure has been put into the soil so that, in addition to their being mostly of alluvial origin, they have by gradual increase of their humic contents become practically garden moulds. Green manuring has also largely contributed to this result, for it is practised to an enormous extent, various leguminous plants being sown for this purpose, such as tares, vetches, peas, beans, &c. The tick or horse bean is a very favourite plant for this purpose and one which is very largely used. It appears to make more growth in the cold weather than peas, and therefore to produce a greater weight of green stuff by the time the moment for ploughing it in comes round. These beans should certainly be worth a trial for green manuring purposes in Victoria.

Rotation is looked upon as being of great importance and, with such a varied choice of products as can be grown, there is no difficulty in carrying it out. Various systems of rotations are in vogue; one strongly recommended by Dr. Maria Marti is as follows:—

Commencing with a worn out lucerne field which has been broken up to a depth of about 18 inches and manured with 1 cwt. of superphosphate and about ½ cwt. of chloride of potash, a crop of hemp is grown which is followed in succession by crops of beans, to be harvested, maize, beans to be ploughed in for green manure, onions, then potatoes or peanuts, after which lucerne may be put in again. It is often sown with wheat as a cover crop. This rotation would extend over a period of six years, the preparatory ploughing for each crop except the beans being about 12 inches deep.

With such a variety of crops to choose from, it is not easy to lay down hard and fast rules and many different rotations are followed according to circumstances.

Visit to Gandia.

I arrived in Gandia by train from Valencia on the evening of 14th January, 1908, bearing a letter of introduction from Mr. *Harker* to his brother-in-law, Senor Romaguera, who is H.B.M. Vice-Consul in Gandia, and who very kindly showed me as much of this interesting neighbourhood as it was possible to see in the brief time at my disposal. Senor Romaguera is largely interested in orange culture and in the varied agriculture of the region, which is practically the same as in the other irrigated areas of Eastern Spain, for Gandia is on a smaller scale, a repetition of the Huerta de Valencia. One finds the same intense culture and carefully applied irrigation as well as the variety of products which has just been described.

From Valencia, one takes the train for Madrid (*viá* Albacete) running south some 30 miles along the coast to Carcagente, another important irrigation centre remarkable for the number of date palms growing about. A snap-shot from the train which is reproduced gives some idea of these trees laden with their crop of yellow fruit. At Carcagente, a change is made to a small local line which takes one on to Gandia and Denia still further down the coast. The carriages on this line are two-storied and from the upper, third-class compartments one obtains an excellent view of the very picturesque country through which the line passes.

Carcagente is some distance inland. Between it and Gandia the line is separated from the sea by the Sierra de Murta, a range of fairly high

hills. The line follows a sort of uneven valley where the land is much broken and the variety of landscape, soils, and cultures is almost bewildering in its sudden changes. Vines, olives and algarrobos are passed in rapid succession, alternating, here and there, with patches of richer soil under cereals very often, or, if water is available, oranges and the numerous other crops characteristic of irrigated land. Norias, or water-lifts of old Moorish pattern, are frequently to be seen; these permit the application of water to small patches—to which it cannot be brought by gravitation—wherever underground water is available, at not too great a depth and the soil is suitable.

Near Tabernes, are large plantations of strawberries. The soil here is poor and hilly. As soon as one leaves the rich land of the Huertas, specialization once more becomes the rule.

Here and there, where the railway passes near the sea-shore, rice fields are to be seen, the whole country side making a picture of prosperity and fertility as striking as it is varied.

DATE PALMS NEAR CARCAGENTE.

Want of space prevents descriptions of such places as Valdigna, Tabernes, Jaraco, &c., all of which are of interest. After passing the imposing fortress of San Juan, with its group of supporting outworks scattered among the rocks and in a somewhat ruinous condition, the country opens out and one arrives at Gandia, situated on a fertile plain irrigated from the river Alcoy which takes its rise in the Monte Aitana.

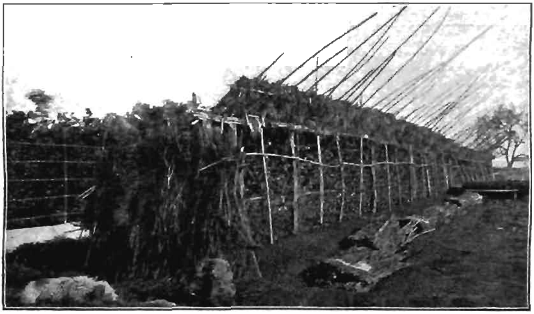
The approach to Gandia is heralded by the number of bamboo shelters in which young tomato plants are raised. These are so numerous as to become a feature of the landscape, thus evidencing the importance of tomato culture in this neighbourhood.

Gandia differs essentially from Denia though the two places are only 18 miles apart. Instead of the dry red soil so suitable for raisin growing, characteristic of the latter place, one finds a rich, dark alluvial soil, probably owing its colour to the manuring of centuries; for intense culture has been the rule here for generations, probably ever since an adequate supply of water was available. At the present day it is still the rule.

Land is dear and its holders make the most of it, not permitting any of it to remain idle long. As many as three crops are often raised on the same land during the one year in something like the following sequence.

Work commences in February, or even January, when tomatoes are planted; the crop is harvested early and replaced by maize at the end of June. This occupies the land during July, August and September, when it in turn makes room for beans either to be harvested or to be ploughed in as green manure. The onion sometimes is substituted for the tomato as the first crop of the series.

Land in Gandia is, as is usual in centres of intense culture, much subdivided, very small holdings being the rule. Orange groves are usually worked by their owners, but land for tomatoes, onions, and the almost innumerable garden products so largely raised, is leased in small areas, rentals varying a good deal. Average tomato land is usually leased at 6 and even to 8 douros per hanegada, which would be equivalent to £8



TOMATO SHELTER NEAR GANDIA.

per acre (at par). Raisins used to be grown about here, even in the irrigated land, until some 20 years ago when over production and the resulting fall in price led to the substitution of oranges wherever water was available. The tomato and the onion also helped to oust the vine, which is now no longer grown on irrigable soil near Gandia, nor are there many unirrigated vineyards in the neighbourhood. The olive seems to monopolize the narrow strip of drier land, fit for cultivation, between the irrigated land and the rocky hills.

Some 30 miles up the river Alcoy, the town of the same name is an important wine centre but near Gandia there are now scarcely any vineyards. Orange culture at Gandia has already been described.

The tomato, after the orange, is the most important export crop. In the mild climate of Gandia the early market is largely catered for. This crop is a risky one, for a severe frost may destroy everything and replantation means missing the early market. The small farmers of Gandia do not, however, devote themselves to one crop only; they are not so foolish as to put all their eggs into one basket; nearly all of them raise a few early tomatoes and at the time of my visit the bamboo and straw shelters in which the young plants are protected from frost, were a striking feature

of the landscape. The photograph on the opposite page shows one of these; the open front is protected at night by a sort of mat woven of straw and string.

Planting out takes place in early February. As early as the middle of January, I saw the complicated shelters to protect the newly planted tomatoes against frost being placed in position and one or two farmers more venturesome than their neighbours were already planting. The young tomatoes were being planted in a shallow trench, the ground removed from which was thrown out on the north side; into this pieces of bamboo a couple of feet long were obliquely driven which served to support the protecting straw mat. The onion is a favourite crop, cheaper and less troublesome to put in than the tomato, and not nearly so risky. It can be planted considerably earlier. At the time of my visit, onions were mostly planted and were to be seen every here and there, usually arranged on double drills each side of a small mound, the intervening gutter serving for irrigation and drainage. The arrangement was such that the rows of onions were equidistant and about 1 foot apart. The cultivation during the growing period, necessary to keep down weeds &c., would result in the gradual filling of the gutter and levelling of the soil. Onions come in at Gandia a little before those from Valencia, for the former town is nearly 40 miles further south. It is estimated that 50 cents per arroba (=32s. per ton) will leave a small profit for the grower.

Beans of all kinds were everywhere in evidence, chiefly of the horse or tick bean variety so largely grown as green manure.

* * * * * * *

It was with regret that I was obliged to leave this interesting region. Though the season was just after midwinter, an unfavorable time of year, my visit impressed me most forcibly and provided me with much food for reflection. The general prosperity I had seen, due entirely to most intense culture, on small holdings, with thorough utilization of land and water, could not fail to make an Australian foresee the enormous future there is before the irrigated areas of northern Victoria when once their occupiers make up their minds to utilize natural advantages to the full extent. Our climate is equal, if not superior, to that of Valencia, and there is nothing to prevent the raising of products on our irrigated lands in similar variety. There cannot be any two opinions as to the benefit which would accrue to the general health of the community from the substitution of vegetables and fruit for a certain quantity of the meat so lavishly used in Australian homes. But, apart from new forms of human food, the possibilities in the way of the raising of fodder plants are not realized, and certainly not developed, as they ought to be in our irrigated areas.

I asked myself if we could not, with advantage, induce some of these Spanish cultivators to try their fortunes in Victoria. Accustomed as they are to the working of their small holdings to such excellent advantage, the homes they would establish here would serve as object lessons to many of our own irrigationists.

We have, in fact, a precedent in the Bendigo district where the now thriving tomato industry owes its origin to a few Spaniards, whose methods, though at first openly criticised by their Australian neighbours, have since been adopted by them.

Suitable men could no doubt be selected. Thousands of Spaniards emigrate every year to the South American republics. Many of these would make excellent colonists and some might be induced, in spite of the language difficulty, to come to Victoria.

WARRAGUL DAIRY FARM COMPETITION.

A. V. Becher, Dairy Supervisor.

Report to the Secretary, Warragul Agricultural Society.

I was rather disappointed to see only three competitors, but, perhaps, now that the competition has been once started there will be a better entry next year.

The stock seen on the farms were well above the average type, especially Mr. Tyssen's Jersey herd, which includes such well-known strains as Werribee Park, Woodmason's and McCulloch's. Mr. Strickland has some very nice Ayrshire cows, and the young cattle from these by milking Shorthorn bulls look very promising. A very strong Ayrshire strain is present in Mr. Gaul's herd, both bulls now used being typical pure bred Ayrshires. All the cattle were in splendid condition and showed evidence of being kindly treated and well fed.

I would like also to specially mention Mr. Tyssen's pure Yorkshire pigs, which were in excellent condition, especially a fine litter of ten by his imported boar "Avalanche" out of one of his best sows. Mr. Tyssen also had a very nice lot of white Leghorn fowls which had returned him a profit of £13 10s. 6d. for the twelve months. Mr. Strickland's stock includes some magnificent medium draught horses for farm work, as well as a very fine team of 14 working bullocks which do the bulk of the heavy work with a set of disc harrows specially made for them.

The two leading farms are well equipped with implements, but Mr. Tyssen gets his work done by contract, and his farm suffers owing to his not being able to get the work done when required. The buildings on the whole are good, and I should like to make a special note of the excellent accommodation provided by Mr. Strickland for his men. The latter have their own cook, kitchen and dining-room, and good wholesome food is cleanly served; all the meat is killed on the place.

The fences on the two leading farms are very good indeed, being solid posts with wire well strained, and good gates provided where necessary. The other farm lost a good many points in this respect, as the fences were in very bad repair and there was not a decent gate on the place.

The sanitary conditions and cleanliness on the two leading farms were satisfactory—especially at Mr. Gaul's. His yards, sheds and cheese room were scrupulously clean. The milking methods were good, the udders of the cows being clean and free from any signs of dirt adhering from wet handed milking without washing. The winning farm lost points in this respect; also for the dusty condition of the yards, which were covered with dry powdered manure. The third farm lost heavily through general untidiness of the cow shed and the quantity of weeds to be seen growing in the yards, garden, orchard and crops.

The cultivation methods on the two leading farms were very good, the land being well worked and the headlands clean and free from weeds. The maize at Mr. Strickland's was especially good, and so was his storage of fodder. He had 25 tons of excellent rye grass and clover hay, and about 120 tons of oaten hay besides good crops of millet, potatoes and onions. Mr. Gaul had some nice maize but, being sown on a hill, it had suffered from the dry spell. The potatoes alongside were excellent.

Mr. Tyssen scored full points for the careful way in which he keeps daily records of each cow's yield and regularly tests them, and I was glad

to see a start being made in this respect at Mr. Strickland's; a room has been set apart with tester, &c., and the system will evidently soon be in full swing.

The returns per cow on all farms were excellent, viz.:—

T. Strickland, £14 13s. 9d. per head for 173 cows (Milk).
J. Gaul, £13 1s. 6d. per head for 63 cows (Cheese).
J. G. Tyssen, £11 12s. per head for 15 cows (Cream).

Last season's prices were exceptional, Mr. Gaul having obtained as high as 1s. per lb. for cheese during Fleet week.

Mr. Strickland has all the up-to-date appliances for handling a big supply of milk for Melbourne, a 22-horse power Hornsby suction gas engine driving his refrigerator and pumping water for the general supply.

The water supply on the two farms at Darnum is excellent. Clean, fresh creek water is laid on everywhere with troughs and ball taps at the winning farm. It is brought by gravitation to a large reservoir and is then pumped by a windmill (or engine if the wind fails) into over-head tanks from whence it is reticulated all over the farm.

It only requires one or two good silos at these two properties to make them complete up-to-date dairy farms.

The result of the judging is:—

Name.	Financial Results per Cow per Annum.	Cleanliness and Sanitary Conditions of Buildings, Yards, &c.	General Management.	Methods of Testing and Keeping Yield.	Type of Cattle, Breeding Methods, &c.	Total Points Gained. Max. 100.	Order.
	20	20	20	20	20		
T. Strickland, Darnum	20	17	19	10	18	84	1
J. Gaul, Darnum ..	17	19	18	5	17	76	2
J. G. Tyssen, Nearim South	15	5	10	20	15	65	3

LUCERNE ON THE UPPER GOULBURN.

A particularly fine sample of lucerne from the third cut was recently forwarded to the Director of Agriculture by Mr. H. Wightman, of Thornton, who has supplied the following details regarding the crop which was grown without irrigation:—

"The sample of lucerne I sent you is from a plot of 2 acres sown in November, 1906, as an experiment. The spring of that year was very wet and suited the late sowing. The amount of seed per acre was from 17 to 20 lbs. which I think is rather heavy as the crop has a tendency to lie down in places, the soil being very rich.

I followed out your instructions with regard to using the scarifier to tear the ground roots, &c., with good results, but I think the disc harrows better for splitting the roots.

The first crop was cut on 28th November, 1908: the second, on 30th December; and the third on the 7th February. I noted the dates as they will be useful when advocating lucerne growing. Over 1 ton to the acre was obtained at the third cut.

I put in an additional 7 acres last September, sowing 15 lbs. of seed per acre. The seed in one part did not come too freely, but I am not disheartened—it is my intention to lay down another portion this year."

THE ORCHARD.

J. Lang, Harcourt.

During the last week in February a good soaking rain was experienced all over the State, an inch and a half being recorded in a great many places. This will be of great benefit to the fruit crop, and the late apples should swell out to a good size. It is possible that further rains may be received as the summer seems now to be completely broken; with a few more showers it will be the best autumn experienced for many years.

Fruit export is now in full swing, picking and packing taking up most of the orchardists' time. Care should be exercised in picking the fruit. Careful handling is necessary, and all bruised and blemished fruit should be rejected. Where apples are of unequal size they should be graded into two grades—Nos. 1 and 2. The cases of apples always open up better when the apples are all fairly of the one size, and the smaller apples sometimes carry better than the larger ones and realize as good a price as No. 1 grade. The apples that have been shipped so far are reported, on the whole, to be of good quality and likely to carry well.

Bitter pit has again made its appearance this season. The apples most affected are Cleopatra and Annie Elizabeth.

The season in London is likely to be much better than last year, as the market is now getting bare of American apples. The speculators who cool stored a large quantity of apples last year are not likely to repeat the experiment this year, as they all suffered severe financial loss over the business.

Pears should be shipped to a moderate extent, as they always realize a good price when they arrive in good condition. As much as 30s. per case was realized last year for Winter Nelis pears. This variety always seems to carry best, and is also one of the finest flavoured pears grown. Josephine d'Malines is also good; so is Beurré d'Anjou, and Beurré Clairgeau. These are all good quality pears, and realize top prices when they arrive in good condition. Broompark and Vicar of Winkfield are pears of second quality and will not realize as much as those named above; still, it is always advisable to send a few of them.

Quinces as a fruit are not much known in the London market, but there should be sale for a moderate quantity. Some of our quince growers should make a few small shipments to test the market.

When time permits, a start should be made in April to sow down the orchard in peas for the purpose of green manuring. They require to be sown early, so that they may get a good start before the cold weather sets in; if sown late, they never make satisfactory progress and there is but a poor crop to plough under in the spring.

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SOME FACTS CONCERNING MAIZE.

F. E. Lee, Agricultural Superintendent.

Public attention has been pointedly drawn of late to the maize-growing industry in Victoria. That the crop can be profitably grown in many parts of the State, both for grain purposes as well as fodder for dairy stock, is generally admitted, but the fact remains that it is only within the last year or two that any extension of the area under this crop has taken place.

MAIZE STATISTICS FOR THE COMMONWEALTH.
Season 1906-7.

State.	Acreage under Maize.	Average yield per acre.
		Bushels.
Victoria	11,559	60.99
New South Wales	174,115	33.10
Queensland	139,806	26.49
Western Australia	101	9.10

During the Season 1907-8, the Victorian acreage fell off to 10,844 acres of maize for grain.

The above table indicates that Victoria is very much behind the other States in the total area of maize grown for grain. Many sound reasons can be given why this is so, but it would appear from the systematic inquiries recently made from dairymen and also from the purveyors of seed maize that there is in reality very little accurate knowledge regarding the characteristics of different varieties and their suitability for fodder or grain. Except in Eastern Gippsland, the growing of maize for grain on a commercial scale is practically unknown. A lengthy experience at Bruthen, Orbost and other centres and the trial of numerous varieties imported from time to time by enterprising growers have given the maize-growers in Eastern Gippsland a great fund of knowledge as regards those varieties for grain purposes only. Truly phenomenal but perfectly authentic yields have been recorded in especially good seasons and upon soils of the best quality, but a glance at the average yield shows that there must be many growers who only realize very moderate returns.

The purpose of this article is primarily to explain the steps which have been taken by the Field Branch to prosecute inquiries into the maize-growing industry, and, secondly, to make public the field observations which have been exhaustively collected during the last season for the purpose of establishing guiding facts. We start with the knowledge that maize is divided into two families—DENT and FLINT; the grain of the former, when pure, are characterized by a crease in the crown of the grain whereas the flint varieties have a smooth rounded surface. We have numerous examples of both in Victoria and it may enable some persons to identify the two families by describing Flat Red as a "Dent" variety and Ninety Day as a "Flint." Arrangements last year were entered into with Messrs. James Fisher (Orbost) and James McEwan (Bruthen) both experienced maize-growers, to permit the establishment of "STUD" plots upon their properties. Field officers had in the year previously gone carefully through the maize-growers' fields and had selected a number of typical cobs of some twenty varieties, which provided the seed for the

STUD MAIZE PLOT AT BRUTHEN.

plots. Especial care was given to the preparation of the land by Messrs. Fisher and McEwan, who also lent valuable assistance in the planting of the seed at regular intervals of 3 feet in the rows and between the drills. A specified number of seeds of each variety were planted which enables us to learn something of the average germinative ability. During the summer the plots were kept well tilled so that the plants had every chance of success.

CROSS FERTILIZATION OF VARIETIES.

By no means the least important of the objects of the STUD plots was the carrying out of a number of cross pollinations between varieties. The varieties to be crossed were decided upon before the plots were sown, so that every facility was afforded to make a large number of crosses at Bruthen and Orbost. An experienced field officer, supplied with a number of muslin bags, was sent to each place in the first week in January. The cobs to be crossed were enveloped in these bags in order to minimize foreign pollination. Only a few of the most robust and well developed

plants of each variety were selected to provide pollen or cobs as the case might be. When the "silk," which is the female organ of the maize plant, began to emerge from the protective sheath surrounding the cob, it was covered with a muslin bag, sufficiently close in texture to exclude pollen, but open enough to admit air and light. The development of the pollen, which is carried by the "tassel" or male organ of the plant, was the signal for cross fertilization to begin. It may be explained that each individual silk on a maize cob communicates with a grain and fertilization is effected by means of the pollen being dusted on the silk, down

PREVENTING FOREIGN POLLINATION.
(Enveloping a cob, selected for crossing, in muslin bag.)

CROSS FERTILIZING MAIZE.
(Dusting the pollen from the "tassel" on to the "silk.")

the centre of which the fertilizing element travels to the grain. Those silks which communicate with the grains lowest down at the butt of the cob emerge first, and when their function is finished they wither off, leaving the silks which fertilize the tip of the cob to emerge later. The whole process lasts from ten to fourteen days, and may be said to be the most critical stage of the maize crop grown for grain. In those cobs upon which crosses were made, the officer carefully removed the protecting muslin bag every second or third morning and dusted pollen upon the newly emerged silks. Crossing is usually carried out in the early morning, the air at that time being calmer than during the day and the silks are said to be more receptive.

Varieties Crossed.

Varieties were not cross-fertilized upon any haphazard plan. The very early varieties were crossed with later ones to influence the period of maturity. Those varieties having a short cob were crossed with others *having a longer cob, thereby carrying a greater amount of grain.* Some varieties bear cobs high up on the stalk, others low down; crosses were made between these to facilitate picking. Some varieties bear a long wedge-shaped grain, others a shorter and thicker grain, the core of some varieties is thicker and coarser than others, thus minimizing the weight of grain that a cob can bear. All these characteristics as well as many others have to be taken into consideration when producing hybrid varieties. *All crosses are not equally successful,* some of the hybrids being inferior to their parents. In these cases, when a final examination of the matured cobs comes to be made, only those which pass a rigid standard will be retained.

Characteristics of Varieties for Fodder Purposes.

In order to ascertain some guiding information in relation to the value of all varieties under review for both grain and forage purposes, a comprehensive set of measurements of average stalks of all varieties was carried out. It must be remembered that these measurements represent average plants, grown under identical conditions of soil and climate, all sown on the same day and all measurements taken within a couple of days.

Varieties of Maize at Bruthen.

Varieties.	Height in Inches to—																Total Height in Inches.
	1st Leaf.	2nd Leaf.	3rd Leaf.	4th Leaf.	5th Leaf.	6th Leaf.	7th Leaf.	8th Leaf.	9th Leaf.	10th Leaf.	11th Leaf.	12th Leaf.	13th Leaf.	14th Leaf.	15th Leaf.	16th Leaf.	
Eclipse	6	11	16	22	28½	36½	44½	52	cob 59½	67½	72½	78½	83	87	92	95	117½
Boone County Special ..	3	6½	9½	12	15	18	25	32	cob 39½	49	53½	62	70	77	84½	92	115½
White Horse Tooth ..	7	13	18½	23½	29	35	41½	48	cob 54½	67	74½	80½	86½	91½	97	..	115½
Leaming	3	5	8	12½	17	22	cob 28½	cob 35	41½	50	58½	64½	72½	78	84	89	111
Solomon's Pride ..	8	12	17	22	29	35	cob 42	cob 49	56	63	70	77	83½	94	..	..	111
Sibley	4	8½	14½	18	23	28½	34½	cob 40	cob 47	53	59	65	71	75½	81	86	105
Funk's Yellow Dent ..	5	8½	12	17	22½	30	36	cob 43	cob 49½	57	63	70	74	78½	81	84	103½
Hildreth's Yellow Dent	6	10½	15½	20	25½	31	35	40	cob 44½	53	60	66	73	80½	..	..	103
Hickory King ..	3	8½	13	18	23	29	34½	40½	cob 46½	cob 52	59½	67½	70	78	..	..	103
Leaming Twin Cobs ..	4	7	9	13	17½	22½	29	cob 35	cob 42	49	56	62	67	71½	75	82	98
Sydney Flat Red ..	6½	9	12	18	24	30½	cob 36½	cob 43	50½	56½	62	67	73	78½	..	..	95
Early Yellow Dent ..	6	10	14	19	25	cob 31	cob 38	45	52	58½	66	72	..	..	..	..	94
Spanish	6	9	13½	18	24	30	cob 38	44½	52	59	63	74	..	..	..	..	90
Longfellow	3	6	10	14	18	24	cob 32	cob 40	48	54½	62	68½	..	..	..	..	89
Blood Red	3½	5½	9	13	cob 17	cob 23	29½	37	44½	52	59½	65½	..	..	..	..	85
Pride of the North ..	4	6	9½	13	18	cob 24	cob 30	36½	43½	51	58	64	..	..	..	..	82
Sweet Corn	4	8	12	15½	cob 19	cob 24	28	33	38½	42½	47	51½	55	58	61	..	81½

Two facts of interest are to be deducted from the table of measurements. The grower of maize for fodder will note that some varieties naturally grow much higher than others under the same conditions of soil. For example, there is a great difference between the height of North-Western Dent, 76 inches, and that of Eclipse, 117½ inches. A dairyman would be very unwise to grow the former if the latter were procurable. Another fact of importance to the dairyman is that some varieties produce more leaves than others. The average minimum number of leaves appears to be thirteen and the average maximum number sixteen. Three leaves extra on each plant in a field would make a great difference in the tonnage per acre. To illustrate what a difference there can be, the following dimensions of the leaves themselves are interesting :—

MAIZE VARIETIES, WITH LENGTH AND BREADTH OF TOP, CENTRE, AND BOTTOM LEAVES IN INCHES.

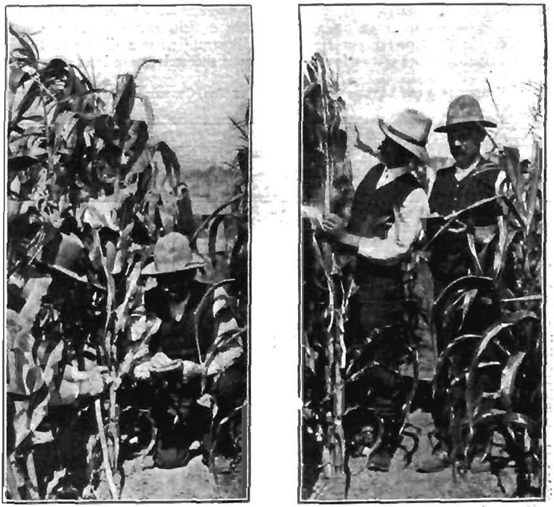
Variety.	Length.			Breadth.			Period of Maturity.
	Top.	Centre.	Bottom.	Top.	Centre.	Bottom.	
Boone County Special	21	40	17	3½	4¼	1½	Late in Season
White Horse Tooth	17½	37	21	2¼	4½	2	,, ,,
Hickory King ..	18	42	18	2	4	1⅜	,, ,,
North Western Dent	16	30	18	2½	4	1	Very early
Early Yellow Dent	24	40	15	1¾	3¾	⅞	Early
Leaming ..	21	43	15	3½	5	1½	Medium
Sibley	16	35	14	2¼	5⅛	1½	,,
Solomon's Pride ..	25	45½	25	3¾	4½	3¾	,,
Sydney Flat Red ..	16	33½	18	2½	5	2	Early
Pride of the North	22	36	14	2⅞	4¼	1¼	Very early
Eclipse	21	44½	20	3⅛	5	1¾	Late
Funk's Yellow Dent	17	39½	12½	2¼	4¼	1¼	Medium
Hildreth's Yellow Dent	24	43	13	3¾	5⅛	1⅛	,,
Longfellow ..	20½	36	13	3⅛	3¾	1⅛	Early
Blood Red ..	21	34½	13½	2¾	4⅛	¾	Medium
Leaming Twin Cobs	21	38½	14½	2¾	4¾	1½	,,
Spanish ..	14	34½	13	2½	5¾	1	,,
Sweet Corn ..	23½	38½	21½	2¾	3¾	1⅛	Early

Pursuing our previous comparison of North-Western Dent and Eclipse, it will be noted that the latter has an extra four leaves at the top—each of which is 21 inches in length and 3⅛ inches in breadth. It will also be noted that, in all cases, the centre leaves of the maize plant are longer than the top ones, which are also longer than the bottom ones. Precisely the same thing holds good with the breadth of the leaves. The column showing the period of maturity gives an excellent index as to the suitability of one or another variety to any particular locality or for successional sowing.

CHARACTERISTICS OF VARIETIES FOR GRAIN.

Reference to the table giving the heights of different maize varieties will reveal a fact of interest to the grain-grower. Not only do some

varieties produce more cobs than others, but these cobs vary in height from the ground. For example, the North-Western Dent produces cobs at 18, 24 and 31 inches from the ground, whereas Eclipse produces one cob at 5 feet from the ground. High-growing cobs hinder rapid picking, for the reason that the stalk has to be bent down before the cob can be pulled off. Low growing cobs are equally undesirable because they compel the picker to bend down, thus increasing the fatigue of the work.



TAKING MEASUREMENTS OF MAIZE IN THE FIELD.

Varieties extensively grown for grain, such as Leaming, Sibley and Solomon's Pride, produce their cobs at from 2 feet 6 inches to 4 feet from the ground, thus making picking much easier.

Weights of Green Fodder per Acre.

In order to ascertain the relative values of the varieties under trial for forage purposes, a given area was cut and weighed at the period when the grain was just glazing.

These weights should only be accepted in connexion with the previous tables referring to the same varieties. Much superior yields have been obtained elsewhere and the following by no means represent the maximum possible.

FORAGE WEIGHTS.

Variety	Tons per Acre.
Funk's Yellow Dent	17.6
Longfellow	16.2
Eclipse	16.2
Boone County Special	15.9
Solomon's Pride	15.9
Sweet Corn	15.6
Hickory King	14.9
Sibley	14.7
Hildreth's Yellow Dent	14.7
Leaming	14.3
Sydney Flat Red	12.9
Leaming Twin Cobs	12.3
Early Yellow Dent	11.9
White Horse Tooth	10.0
North Western Dent	9.7
Pride of the North	9.2

ASCERTAINING WEIGHT OF GREEN FODDER PER ACRE.

It is highly interesting to find from the foregoing tables which varieties appear most suitable for fodder purposes.

Tallest varieties :—

Boone County Special, White Horse Tooth, Hickory King, Leaming, Sibley, Eclipse, Funk's Yellow Dent, Hildreth's Yellow Dent.

Largest number of leaves :—

Boone County Special, Leaming, Sibley, Eclipse, Funk's Yellow Dent.

Broadest leaves :—

Leaming, Sibley, Eclipse, Hildreth's Yellow Dent, Spanish.

Longest leaves :—

Boone County Special, Hickory King, Leaming, Eclipse, Hildreth's Yellow Dent.

It will be seen that two varieties, Leaming and Eclipse, survive all tests, while all the remaining varieties have numerous advantages to commend them.

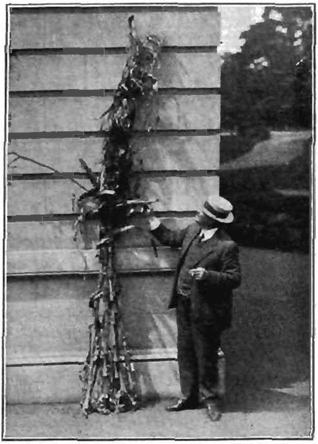
The results of the first season's trials have been completely satisfactory, inasmuch as they have gone far towards settling the suitability of some varieties and the unsuitability of others for forage purposes. Which is the variety most likely to succeed under average conditions and in normal seasons cannot yet be definitely determined. A wider trial, embracing a number of other districts, is projected next season, after which, no doubt, the merits of one or more varieties will be more conspicuous.

The co-operation of the dairy farmer and the enlistment of his sympathy with the aims of the Department is asked for in order to achieve complete success. The stud plots will be continued next season, when the hybrids of the first year's work will undergo further examination so that only the fittest shall survive.

IMPROVED METHODS OF MAIZE GROWING FOR MILK PRODUCTION.

J. M. B. Connor, Dairy Supervisor.

Maize has been used as a forage crop in Egypt and other countries for over 2,000 years. Columbus, who introduced it into America, first found it extensively cultivated by the Indians on the island of Hayti, where it was called mahiz: hence the name maize. Mahiz or marisi is said to be an Arawak Indian word of South American origin. In the United States of America, where it is extensively grown, corn is everywhere understood to mean maize. From America it gradually found its way eastward, until now it is grown for both seed and fodder purposes throughout the universe.



STOOL OF YELLOW MORUYA FROM ONE SEED; WEIGHT 15 LBS.

The area of land under maize for grain in Victoria has been fairly constant from the year 1901–2, as the following table shows:—

Year.	Acreage.	Yield.
1901-2	10,020	615,472
1902-3	10,906	750,524
1903-4	11,810	904,239
1904-5	11,394	623,736
1905-6	11,785	641,216
1906-7	11,559	704,961
1907-8	10,844	508,761

Of the last yield, the production in the principal maize growing counties was as follows:—

County.	*Bushels.*	*County.*	*Bushels.*
Tambo ...	155,184	Bogong ...	17,599
Tanjil ...	124,323	Benambra ...	11,688
Croajingolong	96,255	Buln Buln ...	10,560
Dargo ..	83,070	Delatite	8,090

The total area under green fodder crops in Victoria is 60,000 acres, the greater part of which is maize.

In response to the numerous inquiries made by farmers as to the comparative value per acre of growing maize, as against hay and other cereal crops, it is easy to show the superiority of maize, notwithstanding the reduction in price which will follow a great increase in the quantity produced. The straw of the cereals should be of some value, but as a rule with few exceptions it is burned and its fertilizing value dissipated, except a minute proportion of ash. The strongest point to my mind in favour of maize is that, being largely fed on the farm, it is in a great measure restorative, while wheat or oats carried away from the farm with-

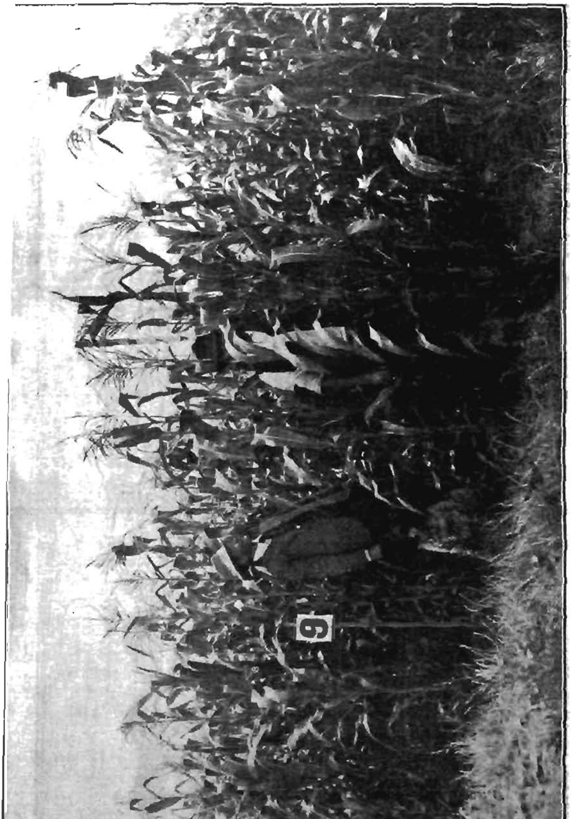
out any return worth considering, is an exhaustive crop. These two diametrically opposite practices must eventually produce opposite results upon soils, one making the rich richer, the other rendering the poor poorer.

SELECTION OF SEED.

In the improvement of maize by seed selection an endeavour should be made to start with the variety best suited to the locality. This should

1. YELLOW MORUYA, HEIGHT 11 FT. 4 IN.

be ascertained by actual tests in the field through a sufficient length of time, so as to be able to eliminate unseasonable weather conditions before arriving at any definite opinion. It must be borne in mind that, in all



2. HICKORY KING, 9 FT. 6 IN.

plant improvement, the same principles and practices that have been so long employed with such convincing results in the improvement of the different breeds of animals must be followed.

With maize there are three general methods of obtaining improvement of varieties, viz.: First, by importation of seed from some reputable grower; second, by careful selection of seed from one's own plot or from a neighobur's; third, by careful selection and growing of seed in an isolated field, say, about 500 yards distance from any other seed plot so as to minimise cross fertilization.

One of the reasons of the Chief Veterinary Officer, Mr. S. S. Cameron, M.R.C.V.S., for getting into close touch with the farmer by means of tests conducted by the latter on his own farm, under the supervision of the officers of the Stock and Dairy Supervision Branch, was to secure definite facts regarding the varieties most suitable for fodder purposes in particular districts. The main points considered during the experiments were:—Bulk of growth, yield per acre, excellence of nutritive quality in stalk and leaves, quickness of maturity at different periods of growth, suitability for early or late sowing, drought-resisting capabilities, and ultimate value as fodder of the different varieties sown, in contrast with the Ninety Day variety or certain mixed varieties known under the names of Flat Red and White maize.

Business Methods Essential.

In no department of profitable dairy farming is there more need for absolutely reliable data than there is regarding the growing of suitable fodder crops throughout the whole year. The time has long passed when the farmer thought there were professions superior to his own. At the present time, some of the most well-to-do men in the State deem it an honour to be a farmer, or are working their large holdings on the share system with practical men. Thoughtful people are realizing that agriculture is the foundation of all wealth, and that it must eventually occupy its merited place at the top, recruiting from all classes of people the most intelligent to follow the highest of all professions, farming. Successful dairy farming must be conducted on business principles and close attention paid to the details of the farm work. Farmers have to use business principles in every day life throughout the year. If they are not selling the produce grown on the farm, they are feeding stock to make a profit, as the markets fluctuate to such an extent that the successful farmer must be an all-round man, who is willing to pay close attention to this important branch of his farm, so as to always have an abundance of cheap and profitable feed on hand all the year round for his stock. The general practical lesson to be drawn from a study of the comparative values of food, is that many foods can be substituted for each other without altering the value of the whole diet. A farmer should be able to introduce economy into his feeding by noting the markets, and making use of those foods which are cheapest and by always growing numerous fodder and root crops in rotation.

Feeding for Profit.

The food of animals has duties to perform which are not demanded of the food of plants. In plants, the food merely provides the material for building up the vegetable tissues. In the animal, besides building up the body tissues, the food has to furnish the means of producing heat and doing mechanical work. Food must be provided for all these factors

before any of it will go to the production of fat or milk, and it is the amount of food that the animal receives over the quantity required for supplying energy for those factors, or over the maintenance diet, as it

3. (1 AND 2) WHITE HORSE TOOTH, 9 FT. 3 IN.; (3 AND 4) EARLY LEAMING, 8 FT.

is spoken of, which effects the gain in body weight or the yield of milk. Consequently, it is evident that there can be no profit in feeding a maintenance diet to a cow giving milk. On the contrary, the aim should

be to get the cow to eat a maximum amount of food in order that there may be a large surplus for production. In this way, a much smaller

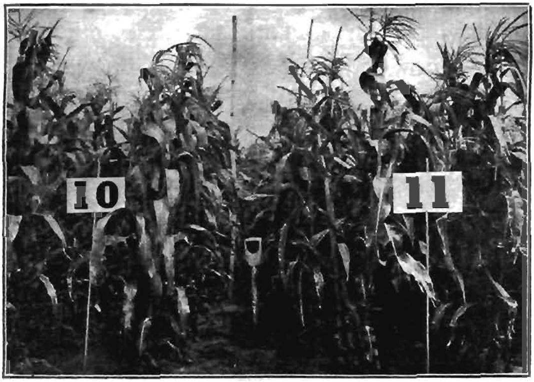
I. (5 AND 6) FUNK'S YELLOW DENT, 7 FT. 6 IN.; (7 AND 8) HICKORY KING, 9 FT. 6 IN.

proportion of the food goes for maintenance and a large proportion to production purposes, with a corresponding increase in the profits.

Naturally, it must follow that the animal which will eat the largest amount of food, and which at the same time is of such a disposition as to require a small amount for maintenance purposes, is the most profitable cow to keep, and this important point can only be ascertained by weighing each cow's milk, testing it weekly, and judicious culling out of the unprofitable cows.

Green versus Dry Fodders.

The advantages and disadvantages in feeding green as compared with dry fodders has always been a much discussed subject. After weighing both sides, it seems feasible that the compounds of a cured or dry fodder, which has not deteriorated through fermentation, are practically what they were when in the green, freshly-cut stage, excepting that the water has evaporated out of the green tissues, and that in the curing



5. (10) Eclipse, 8 feet; (11) Sibley, 8 ft. 6 in.

iere is a probable loss of an imperceptible amount of volatile comounds, whose presence in the plant affects its flavour. It is obvious iat drying a plant diminishes its palatableness and increases its tougbess, thus increasing the work of mastication. It is not always possible › dry fodders under perfect conditions, and when they are subjected to ›ng continued and slow drying in rainy weather, fermentation takes lace with the probable loss of considerable material. All these risks in be done away with by having a silo and conserving the fodder in its atural condition, until required for feeding purposes. A very imortant point that is mostly lost sight of by the farmer is the absolute ecessity of cutting his fodder crops at the right stage of maturity, and is here that a great amount of waste often occurs in the feeding value f the crop by cutting it in an immature condition.

In general, it is recognised that as a plant matures the proportion of ater, protein, and ash matter decreases, while the proportion of carbo-

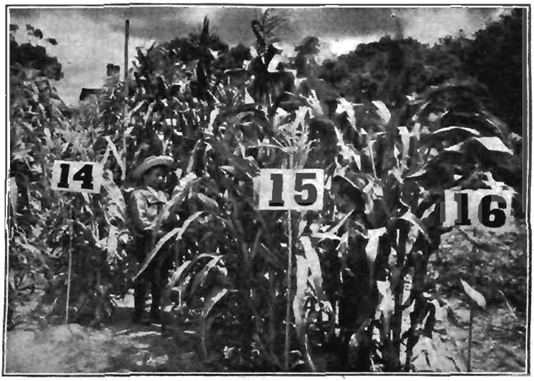
hydrates, especially the fibrous material, increases. As this latter substance is mostly indigestible, fodder crops deteriorate towards maturity. Young grass is much richer in protein and contains a smaller proportion of indigestible fibre than old grass, and is therefore more nourishing. The same comparison may be made between young lucerne and that which is made into hay. It follows that fodder crops should be cut for hay before they reach maturity, and before they enter into the ripening stage; experimental work and general experience have fully demonstrated that these crops should be cut immediately full bloom is reached. Lucerne is an exception to this, because it very readily becomes fibrous, and should be cut in the early stages of blossoming to obtain best results. With

6. (12) PRIDE OF THE NORTH, 4 FT. 6 IN.; (13) WHITE HORSE TOOTH, 8 FEET.

reference to root crops, it has been found that while fodder crops deteriorate and become fibrous towards maturity, because of the conversion of soluble forms of carbo-hydrates into the insoluble and indigestible fibre, root crops, such as mangolds and potatoes, improve owing to the carbo-hydrates produced in this case being sugar and starch, both of which are of considerable feeding value.

The present consideration of farmers should be the preservation of their lands with relation to productiveness and the character of material produced. If there has been degeneracy of seed in quality or prolificacy, appliances for restoration must be resorted to and a more careful system of farming followed, a system based upon scientific investigation and gathered experience. If plant growth is not supplied with its natural

food, there is deterioration; if there is no attention paid to the selection of pure seed, there must follow degeneracy. It is perfectly true that on account of climatic influences and through unmethodical management, seeds deteriorate, that the product of to-day may not be that of to-morrow. But the necessity for adopting means of change for the better is obvious. The undoubted conclusion is that greater attention ought to be paid to the conversion of material raised from the soil into valuable form, thereby stimulating production and adding to the proceeds of industry. The wealth from this source to the State can scarcely be estimated.



7. (14) NORTH WESTERN DENT, 4 FEET; (15 AND 16) BOONE COUNTY SPECIAL, 9 FEET.

Mr. Wm. Young's farm of 18 acres, situated at Tooronga-road, Malvern, is a striking illustration of keeping the land in good heart. Twenty-five years ago this particular farm was carrying a good growth of box gum and peppermint scrub, and the first crop of oats sown was a failure. The land has been continually cultivated and two crops taken off it yearly without a spell. Instead of the soil becoming poorer and poorer each year, the land to-day, by the judicious system adopted by Mr. Young of always growing a rotation of crops, has a wealth of available plant food, good physical condition, and capacity for holding moisture and grows such magnificent crops as shown in photographs 1 to 8 which were taken on the 23rd January of the current year.

These good results have been brought about by replacing the plant food removed from the soil by continuous cropping. This has been done by the application of farm yard manure conserved on the premises, by the use of ploughing in green crops, the rotation of crops, and by the application of blood manure. When plenty of farm yard manure is not available, the quickest way to put land in good heart and increase the organic contents of the soil, and improve its physical condition, is by the system of ploughing in green leguminous crops, such

as peas, vetches, or clovers. Commercial fertilizers are always of value, in that they supply available plant food but they will not take the place of farm yard manure because they do not add vegetable matter to form humus and thereby improve the physical condition of the soil. They can, however, be successfully used at the time of seeding, in conjunction with farm yard manure, to furnish the mineral elements—phospborus and potassium—and to supply a greater abundance of plant food for the crop while young and tender. It has come under my notice that whenever the farmer applies a large amount of farm yard manure, and goes in for green manuring, his crops are the heaviest and the land is improved in texture.

8. GENERAL VIEW OF MR. WILLIAM YOUNG'S 3-ACRE PLOT.

Mr. Young's plot of 3 acres contained the following varieties:—Hickory King, Sibley, White Horse Tooth, Early Leaming, Eclipse, Funk's Yellow Dent, Pride of the North, Boone County Special, and Yellow Moruya. These varieties were sown in drills 3 feet apart and 4 inches deep on the 14th October, 1908, and nearly all germinated by the 21st of that month.

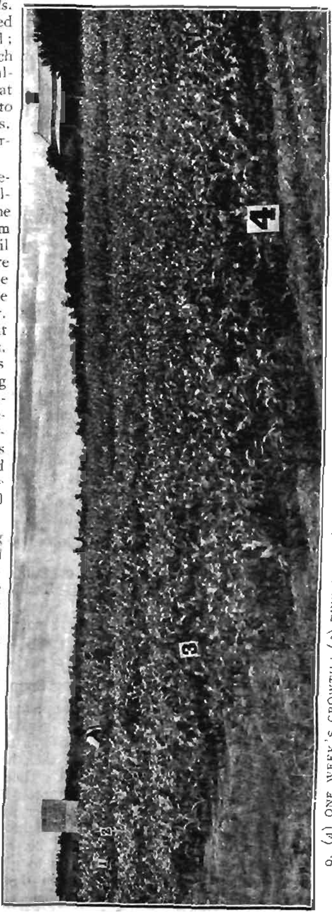
PREPARATION OF SEED BED.

The soil is a dark sandy loam for about 4 feet deep with a sticky whitish gravel subsoil and a westerly aspect on a sloping hill. Early in October, a very heavy crop of oats was taken off the land which was at once ploughed 8 inches deep, and then harrowed and cross harrowed. It was cross ploughed in a fortnight's time and harrowed twice again. Mr. Young is a great believer in a thoroughly prepared seed bed. To thoroughly pulverize the soil is the proper work of the plough, and whether the ploughing be deep or shallow, the more thoroughly the portion turned is pulverized the better it will be. The object of this breaking down of the soil into fine particles is to give the rootlets of the plants an opportunity to anchor themselves in the soil and get the abundant nutriment necessary for the full development of the plant. If the land is

turned up into rough clods, the roots are not furnished with available plant food; hence the necessity of such a thorough and minute pulverization of the soil that will *not only* bring it into closer contact with the roots, but will increase its water-holding capacity.

The first condition therefore is a thoroughly pulverized seed bed. The water is found in a film around each particle of soil and the more particles there are, that is, the finer the soil has been broken up, the greater capacity for water. The physical condition, that is, the friability, openness, or crumbliness of a soil, is most essential to growing good crops; also its capacity for absorbing and retaining water, its permeability to roots and its capacity for absorbing and retaining heat, are of more importance than its chemical composition.

The next important thing is close contact of the turned furrow with the subsoil beneath. Why? Because no furrow slice, however thoroughly broken up, can hold anything like the amount of moisture necessary for the plants that grow in it; hence it must be in close mechanical contact with the subsoil, in order that water may be drawn up by capillary action and thus be made available for the plant. To plough as some farmers do and let it lie without subsequent pulverization and impaction to make this connexion with the subsoil, is simply to dry it out.



9. (4) One week's growth; (3) Two weeks' growth; (2) Three weeks' growth; (1) One month's growth.

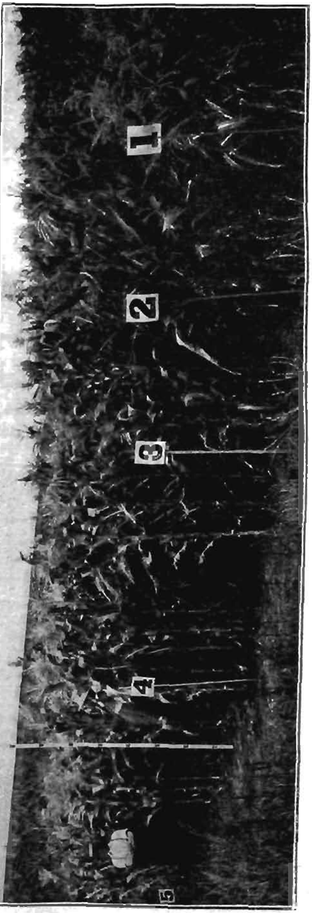
10. THE SAME CROP (PLOT 3) SIX WEEKS LATER.

Method of Sowing.

After preparing this good seed bed, the land was marked out with the plough in rows 3 feet apart and ploughed 4 inches deep. The seed was dibbled in by hand and sown about 4 to 6 inches apart and at the rate of about 14 lbs. to the acre. The land was then harrowed the same way as the drills, and cross-harrowed again, so that the land was actually harrowed six times and was in splendid tilth. When the plants germinated in a week's time and the rows showed clearly, blood manure at the rate of 2 cwt. to the acre was sown broadcast and scarified in with the horse hoe between the rows. This surface cultivation was continued at different intervals (about four times) between the growing period with the horse and hand hoes, and during the whole growing season there was not a weed to be seen.

Conserving the Moisture.

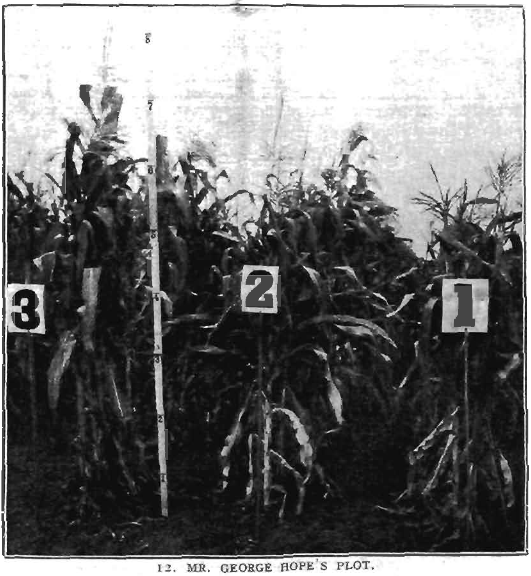
To keep down weeds and conserve soil mosture is the great problem for the farmer to grasp. The great agency employed for this important work is some system of mulching. It is simply a loose blanket of earth which dries out, preventing the water below from passing up through it to the atmosphere. The effectiveness of this simple method of conserving the moisture in the soil is beyond the comprehension of the



11. Mr. A. G. Ninnis' Plot.

(1) Longfellow, 3 ft. 6 in.; (2) Solomon's Pride, 6 feet; (3) Early Yellow Dent, 7 feet; (4) Hickory King, 8 ft. 6 in.; (5) Flat Red, 7 ft. 6 in.

average farmer, simply because he has not tried it. To be the most effective, these stirrings of the soil should take place directly after each rain, provided the ground will permit. Experiments have proved that a mulch 3 inches deep prevents a loss of 36 per cent. of the moisture which occurs when no mulch is used. The average saving by means of mulches ranges from 25 per cent. to 50 per cent., varying with the particular depth cultivated. A delay of one week in spring or after a good rain will result in a loss of moisture by evaporation equal to $1\frac{3}{4}$ inches of rain, or enough to tide a crop over a couple of weeks' severe drought. The farmers in the northern areas and the Mallee country are fast realizing this important method of conserving the moisture in the



12. MR. GEORGE HOPE'S PLOT.

(1) Little Yankee, 6 ft. 6 in.; (2) Funk's Yellow Dent, 7 ft. 6 in.; (3) Boone County Special, 8 feet.

soil by a system of summer fallowing of their lands, thereby conserving enough moisture in the ground before sowing the seed to tide the young plants over a spell of dry weather next season.

Photograph No. 1 shows a plot of Yellow Moruya which was sown 14th October, and germinated on the 21st; 11 ft. 4 in. high. It stooled freely, one stool of three shoots weighing 15 lbs. (See page 200). It is a vigorous rank growing variety, comes to maturity rather late, and has abundance of flag. On the 5th February, it weighed 55 tons 19 cwts. per acre, and was just starting to cob.

No. 2 (9) Hickory King. This variety has small white ears and broad and shallow grains. This is a prolific variety and stands very high as a fodder in my estimation, flowered the 1st week in December, and started to cob on 21st January. It has abundance of luscious leaves and is very sweet and sappy; 9 feet high and weighed 30 tons 18 cwts.

No. 3 (1 and 2) White Horse Tooth.—Flowered second week in January, 1909, is very similar in growth and appearance to the Hickory King but does not stool so freely. Height when cut, 9 ft. 3 in., and it weighed 25 tons.

No. 3 (3 and 4) Early Leaming.—This variety was the earliest to germinate and for the first two months walked away from the other varieties. It flowered the 2nd week in January and was cobbed and fully matured on 16th January. Weight, when cut at 8 feet, was 20 tons 15 cwts.

No. 4 (5 and 6) Funk's Yellow Dent.—A good, hardy maize with plenty of succulent leaves, stooled well, flowered second week in January, half cobbed when cut and weighed 18 tons 3 cwts. on 12th February.

No. 4 (7 and 8) Hickory King.—One of the best grown, 9 ft. 6 in. high.

No. 5 (10) Eclipse and (11) Sibley.—These are good growers, with plenty of foliage, stool and cob well, and come to maturity early. Flowered second week in December, and on 12th February were ready for cutting. Height, Eclipse, 8 feet; Sibley, 8 ft. 6 in. Weight, Eclipse, 22 tons; Sibley, 23 tons 1 cwt.

Contrast these results from up-to-date methods against the slovenly out-of-date methods employed on the farm a few hundred yards along the same road. This is clearly shown in photograph No. 16. The crop (Ninety Day maize) was sown on the 4th of September, manured at the rate of 20 loads of stable and cow manure to the acre and sown at the rate of 2 bushels of seed to the acre. The crop was choked with such bad weeds as fat hen, sorrell, and hogweed, was only 1½ feet high, flowering, with no chance of ever cobbing. It would only return about 1½ tons of rubbish to the acre, and contained absolutely no nutriment.

No. 6 (12) Pride of the North.—A very early variety. Flowered 21st November, 1908; 4 ft. 6 in. high, very heavy cobber. Should be sown six weeks earlier. Weight 8 tons 16 cwts.

No. 6 (13) White Horse Tooth.—Stooled and cobbed well, flowered early in December and was fully matured and ready to cut on 12th February, plenty of green succulent sweet foliage. Height 8 feet. Weight 24 tons 1 cwt.

No. 7 (14) North-Western Dent.—Flowered third week in November. A very early maturing variety, well cobbed on 14th December. Height 4 feet. Weight 11 tons. This variety requires to be sown early.

No. 7 (15 and 16) Boone Country Special.—Is a splendid variety of white maize, comes to maturity early and stools freely with plenty of succulent foliage. This and Hickory King are two of the most reliable varieties to grow. Height 9 feet. Weight 24 tons 3 cwts.

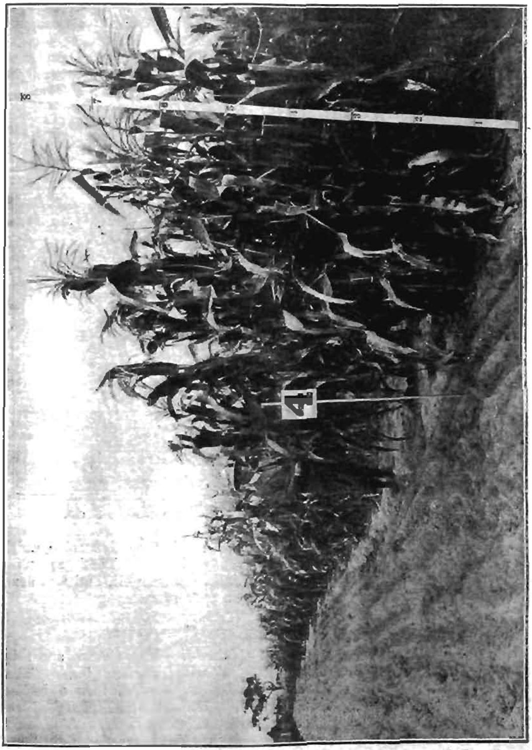
No. 8.—General view of Mr. Wm. Young's plot of 3 acres.

No. 9.—Shows how maize should be sown so that it will come in for cutting as each plot matures.

4 shows one week's growth after seeding.
3 shows two weeks' growth after seeding.
2 shows three weeks' growth after seeding.
1 shows four weeks' growth on 23rd January, 1909.

No 10.—Shows the same crop taken on 4th March. Height 9 ft. 6 in. Weight 35 tons.

No. 11.—Shows plot grown on Mr. A. G. Ninnis' farm at East Malvern. This soil is stiff, light, grey, clay subsoil. with a sloping northerly aspect. The land was very roughly worked. owing to the short time at Mr. Ninnis'



13. (4) HICKORY KING, 8 FT. 4 IN., MR. GEORGE HOPE'S PLOT.

disposal between the cutting of the previous crop of oats and the planting of the maize, and the results obtained under these circumstances reflect great credit on Mr. Ninnis, junior, who kept the ground well cared for and free from weeds. No. 1 in the picture shows the Longfellow variety. This seed was sown in drills 3 feet apart, 4 inches deep, and

was harrowed twice and manured with cow manure at the rate of twelve loads to the acre. The seed was sown on the 12th October and germinated on the 23rd of that month, slightly in advance of the four other varieties—12th to 20th November. All the plants were 1 foot high. The Longfellow variety came early into flower when only 3 feet high. The other varieties did not flower until the first week in January. On 12th February, Longfellow was 3 ft. 6 in. high, heavily cobbed, and in the glazed stage of maturity, and 1 chain cut weighed 17 tons 13 cwts. No. 2 (Solomon's Pride) 6 feet high, well cobbed and stooled, weighed 23 tons 11 cwts. No. 3 (Early Yellow Dent) cobbed up well, rather light in stalk and stooled badly. Weighed 17 tons 15 cwts. No. 4 (Hickory

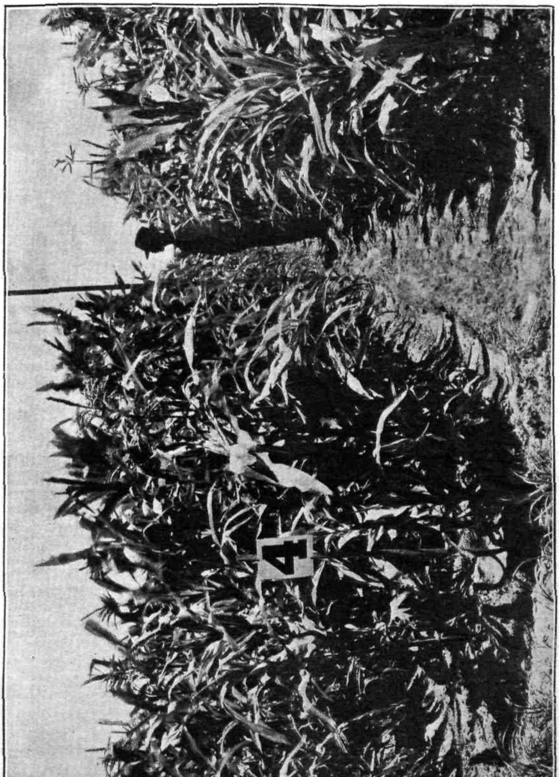
14. (5) NINETY DAY, 3 FT. 6 IN., MR. GEORGE HOPE'S PLOT.

King) stood out very much as the best variety in this plot. It stooled well, with abundance of succulent leaves, cobbed well and weighed 27 tons 10 cwts. No. 5 (Flat Red) made good growth, stooled well, and was next to Solomon's Pride in weight. Weighed 20 tons 16 cwts.

EFFECTS OF CONTINUOUS SURFACE CULTIVATION.

No. 12.—Mr. Geo. Hope's crop at Caulfield. Three years ago this particular land was a sandy waste, covered with bracken fern. The soil for the first 18 inches is composed of a white sand, then 6 inches of yellow clay overlying a bed of gravel. The land was ploughed 10 inches deep and harrowed and cross harrowed three times. The seed was sown in drills 3 feet apart, and 4 inches deep, on the 29th September, and germinated on the 10th October. The seed was sown at the rate of 12 lbs. of maize to the acre, and the land was manured with twelve loads of stable manure and 1 cwt. of superphosphate drilled in at time of planting. The rainfall for the whole of the time was 3 inches 23 points and the crop received no artificial water. This speaks

volumes for surface cultivation, as, during the whole of the dry spell experienced during the growing period, the soil was kept comparatively



(4) ECLIPSE, 8 FEET, MR. W. J. HILLARD'S PLOT

moist, through the continuous inter-cultivation between the rows with the horse hoe. No. 1 in the photograph shows the variety Little Yankee

16. NINETY DAY MAIZE SOWN BROADCAST, $1\frac{1}{2}$ FEET.

17. NINETY DAY MAIZE AND FLAT RED SOWN BROADCAST, 2 FEET.

Crop full of "fat hen" and other weeds.

6 ft. 6 in. high. This gave me the impression of requiring a stronger soil. It did not stool very well and cobbed very thinly. No. 2 (Funk's Yellow Dent) 7 ft. 6 in. high, stooled well, showed more vigorous growth and cobbed well. No. 3 (Boone County Special) 8 feet high, stooled well, came to maturity early with plenty of cobs, and abundance of succulent fodder.

No. 13 (4).—Hickory King, 8 ft. 4 in. high, was a vigorous grower, came to maturity early with plenty of sappy sweet foliage, stooled freely, and was much the best variety grown on this farm.

18. CROP FLAT RED VARIETY SOWN BROADCAST; HEIGHT, 2 FEET.

No. 14 (5).—Shows a plot of the commonly sown variety of Ninety Day maize, grown on the same farm under precisely the same conditions as to climate, inter-cultivation between the rows, and manure, and yet it only grew 3 ft. 6 in. high and was stunted in growth, showing clearly that the time has arrived when more attention will have to be devoted by the farmer to the careful selection of a more suitable variety of seed maize.

No. 15.—Shows a plot of maize planted by Mr. Hillard, Belgrave-road, East Malvern, and reflects great credit on the grower, when one takes into consideration the bad season and the difficulty the owner experienced in ploughing his land at the time of sowing. The soil is a light loam with a yellow clay subsoil; was ploughed twice 6 inches deep, cross harrowed and manured at the rate of eight loads of stable manure and a mixture of 1 cwt. of superphosphate and ½ cwt. sulphate of ammonia to the acre. The seed was sown on 28th October, and germinated ten days later. It was sown in drills 3 feet apart and planted 4 inches deep. Longfellow, White Horse Tooth, Early Leaming and Eclipse were sown. No. 4 shows plot of Eclipse which grew the highest in the plot

—8 feet. It stooled fairly well, but was very thin in the stalk and consequently was disappointing in the weight, stooled and cobbed only fairly well. Weight 12 tons 5 cwts. White Horse Tooth stooled and cobbed well with plenty of succulent leaves and weighed 15 tons 14 cwts.

19. MESSRS. RALPH BROTHERS' CROP, 10 FT. 6 IN.

Early Leaming, 7 feet high, matured earlier than the other varieties and weighed 12 tons 11 cwts. Longfellow was very stunted, 4 feet high; weighed 10 tons 2 cwts. Flat Red very stunted and badly cobbed; weighed 6 tons 18 cwts.

A little further along the same road can be seen a crop of Ninety Day maize sown broadcast (see photograph No. 17). Here again one sees the usual results of such methods. The crop was sown broadcast on the 12th October, ploughed in 4 inches deep, and manured at the rate of twelve loads of manure and 2 cwt. of bonedust per acre. The crop looked very promising about the end of November, but as soon as a spell of dry weather set in and all the moisture evaporated out of the soil, it commenced to wilt and go off at once. Then the weeds started to grow, with the result that on the day the photograph was taken (13th January) there was a better crop of "fat hen" and other weeds than maize, and the field of green fodder, containing practically no nutriment, would only yield about 2 tons to the acre.

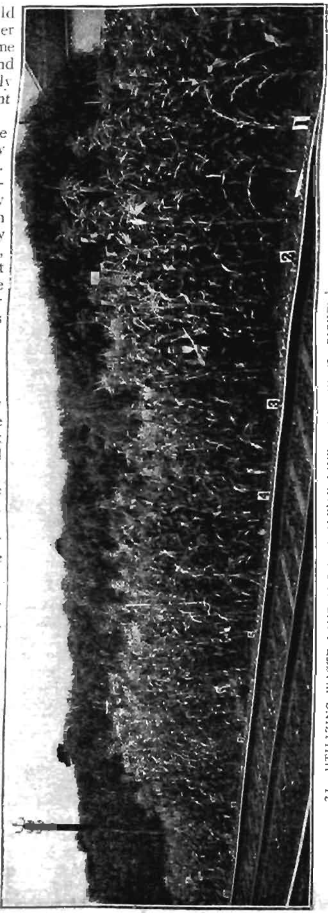
20. CROP OF NINETY DAY MAIZE SOWN BROADCAST. $1\frac{1}{2}$ FEET.

Still a worse illustration of absolute wasteful methods was employed by a farmer at East Brighton (No. 18). In this case the land was ploughed twice and harrowed, and White and Flat Red varieties of seed ploughed in on the 7th November at the rate of $7\frac{1}{2}$ bushels to the acre in every third furrow. The land was manured at the rate of 24 loads of cow manure to the acre. The result was a thick growth of stunted maize that wilted off after the first few hot days, and consequently neither flowered or cobbed and only returned about 3 tons of fodder to the acre.

No. 19.—Plot of maize grown by Messrs. Ralph Brothers of Hampton, estimated to weigh 45 tons to the acre. It was sown early in November in drills 3 feet apart and constantly cultivated between the rows. It is of a very uniform crop and stands 10 ft. 6 in. high with a tremendous wealth of green succulent foliage. It has stooled freely and cobbed thickly. A great contrast is to be seen in a plot of broadcast maize (Ninety Day variety) at Waverley-road, East Malvern (No. 20) which was sown at the rate of 2 bushels of seed to the acre during November, and manured at the rate of twelve loads of stable manure to

the acre. This crop would not yield 1 ton of fodder to the acre, and at the time of inspection was dry and wilted, and practically useless as far as nutriment is concerned.

No. 21 shows how the waste land on the railway lines can be utilized. Mr. W. T. Picken at Hawksburn has successfully grown the following ten varieties of maize:—Early Leaming 10 feet high, Longfellow 6 feet, Reflet 8 feet, White Horse Tooth 9 feet, Hickory King 10 ft. 6 in., Funk's Yellow Dent 10 feet, Yellow Moruya 11 feet, Solomon's Pride 12 ft. 4 in., and Sibley 10 ft. 6 in. The soil is sandy with a clay subsoil and the plants were sown in check rows 2 feet apart and continuously cultivated. The seed was sown on the 10th October, and all germinated by the 20th. The land was heavily manured with stable manure.



21. UTILIZING WASTE LAND ALONG RAILWAY LINE. MR. W. T. PICKEN'S PLOT OF 13 VARIETIES.

No. 2 in photograph shows Solomon's Pride, 12 ft. 4 in. high.

A Simple Method of Obtaining a Well Balanced Ration.

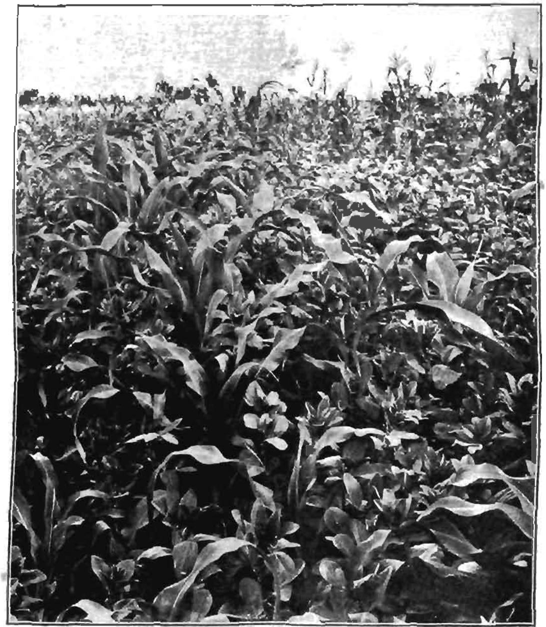
Photograph No. 22 shows the results of an attempt made to obtain a crop of beans and a crop of maize off the same land in one year. Tick beans were planted in drills 6 feet apart early in July. This was too late for a satisfactory yield, but owing to the unusually dry conditions prevailing during last autumn and winter the late sowing was unavoidable. This

crop grew about 5 feet high and yielded a satisfactory crop of seed. In the meantime, on 15th November, maize (Hickory King) had been thinly sown for cobs in drills 6 feet apart, alternating with the rows of beans. The beans were harvested about the end of December, and the

22. DR. CHERRY'S CROP OF SEED MAIZE (HICKORY KING) SHOWING TICK BEANS BETWEEN ROWS.

intervals between the rows of maize kept cultivated at periods of about a fortnight. The heavy rain which fell shortly after the New Year made it certain that a great number of the self sown beans which had fallen from the lower pods on the stalks would speedily germinate. About ½

bushel of maize to the acre was accordingly broadcasted between the rows on the last cultivation. The results on 3rd March are seen in photograph No. 23. The young maize stands from 18 inches to 3 feet high, while the dense mass of self sown beans completely fills the intervals between the rows of tall maize now approaching the ripening stage. This crop is growing on an old tea-tree flat subject to flooding during the winter months. Each crop has been sown with 1 cwt. of super-



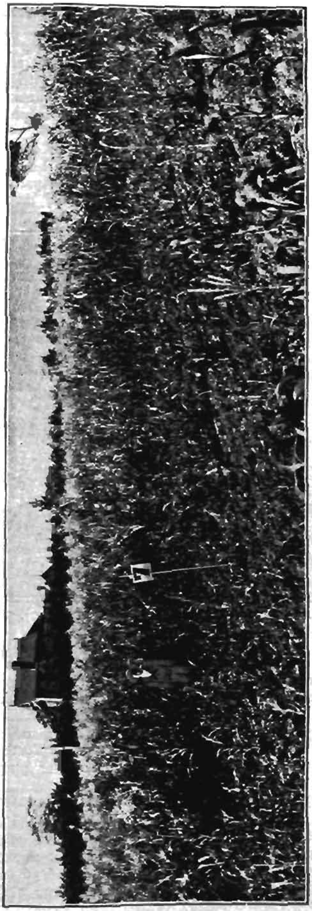
23. DR. CHERRY'S CROP OF MAIZE AND TICK BEANS SOWN BROADCAST.

phosphate to the acre. In many parts of America a somewhat similar system is practised, crimson clover being the crop most usually sown between the maize at the last cultivation.

SATISFACTORY RESULTS AT TRIFLING EXPENSE.

In photograph No. 24 are seen the effects of superphosphates on a clayey hillside at Glen Iris (silurian formation). An area of 4 acres was planted on 10th November with maize (Hickory King) at the rate

of 20 lbs. to the acre in drills 3 feet apart. No artificial manure was used on the six rows in the foreground. The remainder of the crop was manured at the rate of 1 cwt. superphosphate per acre. All parts of the paddock have received the same treatment, namely, harrowing about a week after the crop was planted and four scarifyings during the growing season. The portions without superphosphate have come up very thin and irregular. At present they are coming out in flower and on the average are about 18 inches high. The yield of green stuff will probably be not more than 5 cwt. per acre. In the background the crop is uniformly high, all over 7 feet, the stalks large and the leaves broad and luxuriant. Its yield per acre will probably be at least 8 tons.



24. VALUE OF MANURING.

No manure applied to foreground; yield, 5 cwts. per acre. Background manured at rate of 1 cwt. superphosphate per acre; yield, 8 tons per acre.

Summary.

The number of varieties in the different tests ranged from five to ten different varieties of seed maize. They were grown as nearly under the same conditions of soil, time of planting, and cultivation, as it was possible to provide. To eliminate all inequalities in the character of the land (if any) the varieties sown on the different farms were each planted in separate rows and arranged consecutively. By taking these precau-

tions, the results herein recorded should be reliable and of value to the farmer, especially when one takes into consideration the dry and unseasonable weather experienced throughout the growing season.

In a general way, a variety represents a class of plant with one or more distinguishing characteristics; but with maize, which crosses so readily, variety does not signify much unless proper precautions have been taken in its growth. This fact emphasizes the importance of securing seed from some reliable source.

The *early maturing varieties* were sown on 14th October and included *Longfellow*, *North Western Dent*, *Early Leaming*, *Pride of the North*, Hickory King, Boone County Special, Eclipse, Sibley, and White Horse Tooth. The first four should be planted much earlier than the others which are medium maturing varieties.

25. PLOT OF SEED MAIZE (HICKORY KING), EACH HALF ALTERNATE ROW DETASSELLED.

The *late maturing varieties* were Yellow Moruya, Red Hogan, Solomon's Pride, and Little Yankee.

Summing up my last year's experience, which corresponds with this year's yields, I would recommend Hickory King, Yellow Moruya, and Boone County Special as reliable yielders of abundance of sweet succulent fodder, with Sibley, White Horse Tooth, and Early Leaming as the next best varieties to grow for fodder purposes.

DRILLING VERSUS BROADCASTING.

It will be interesting here to consider the cost of growing an acre of the three largest yielders in these tests, as against the three broadcast sown crops grown in the same district of which I have particulars.

Yellow Moruya yielded at the rate of 56 tons per acre (Photograph No. 1) as against the broadcast sown crop a few hundred yards along the same road (No. 16) which yielded 2 tons to the acre.

The following items represent the cost of production:—

Yellow Moruya.	Per acre. £ s. d.	Broadcast.	Per acre. £ s. d.
Rent of land	1 0 0	Rent of land	1 0 0
Ploughing	0 10 0	Harrowing (twice) ...	0 2 0
Seed (12 lbs.)	0 1 0	Manure (20 loads cow manure, 3s.)	3 0 0
Harrowing (four times) ...	0 4 0	Seed (2 bushels at 4s.) ...	0 8 0
Rolling	0 1 0	Sowing	0 2 0
Drilling	0 1 2	Harrowing (twice) ...	0 2 0
Inter-cultivation (four times at 1s. 3d.)	0 5 0	Cutting	0 4 0
Manure	0 6 0	Carting, at 2s. per ton ...	0 4 0
Cutting	0 4 0		
Carting, at 2s. per ton ...	6 0 0		£5 2 0
	£8 12 2		
56 tons, valued at £1 8s. per ton, equals ...	£78 8 0	Two tons, valued at £1 8s. per ton, equals ...	£2 16 0
Less cost of production ...	8 12 2	*Actual loss on crop* ...	£2 6 0
Profit ...	£69 15 10		

Hickory King (Photograph No. 2) returned at the rate of 30 tons per acre as against broadcast sown plot at Waverley-road (No. 18).

Rent of land, manure, and cultivation, the same (less difference in cost of cartage due to smaller yield) as Yellow Moruya, viz., £5 12s. 2d. per acre.

Totals, £42 (reckoning the maize value at £1 8s. per ton). *Profit*, £36 7s. 10d.

As against:

Broadcast.	Per acre. £ s. d.
Rent of land	1 0 0
Ploughing	0 10 0
Manure (12 loads at 3s. per load)	1 16 0
Sowing	0 2 0
Cutting	0 2 0
Carting (2s. per ton for 2 tons)	0 4 0
Seed (2 bushels at 4s. per bushel)	0 8 0
	£4 2 0

Yield, 2 tons per acre, at £1 8s. per ton, £2 16s., showing an *actual loss* of £2 6s. per acre.

White Horse Tooth, returned at the rate of 25 tons to the acre as against broadcast crop sown at East Brighton (Photograph 17).

Rent of land and expenses the same (less difference in cost of cartage due to smaller yield) as Yellow Moruya, viz., £5 2s. 2d. per acre.

Total, £35 per acre (reckoned at £1 8s. per ton). *Profit*, £29 17s. 10d.

As against:

Broadcast	Per acre. £ s. d.
Rent of land	1 0 0
Ploughing	0 10 0
Manure (24 loads at 3s.) ...	3 12 0
Seed (7 bushels at 5s.) ...	1 15 0
Sowing	0 2 0
Cutting	0 2 0
Carting (2 tons at 2s. per ton)	0 4 0
	£7 5 0

Returned—3 tons at £1 8s. per ton, £4 4s.
Actual loss—£3 1s. per acre.

On the other hand, the farmer growing the Yellow Moruya and obtaining a return of 56 tons to the acre, secured a yield valued according to its nutritive ratio, when contrasted with bran, as follows:—

	Dry Matter.	Digestible nutrients in 100 lbs.			
		Protein.	Carbo-hydrates.	Fat.	Nutritive. Ratio.
	(per 100 lbs.)				
Maize	25·	1·3	13·5	0·6	1:11·5
Bran	85·3	11·2	42·2	2·5	1:4·3

Reckoning the protein as worth twice as much as the carbo-hydrates, and the fats as worth three times the carbo-hydrate:—

Bran.			Maize.		
Protein, 11.2 x 2 ...	=	22.4	Protein, 1.3 x 2 ...	=	2.6
Carbo-hydrates ...	=	42.2	Carbo-hydrates ...	=	13.5
Fats, 2.5 x 3 ...	=	7.5	Fat, 0.6 x 3	=	1.8
		72.1			17.9

One ton of bran at 1s. per bushel (20 lbs.) = £5 12s. per ton, therefore 72.1 lbs. of bran will cost 5s., as against 17.9 lbs. of maize costing 1s. 3d.

Hence, as it requires 4 lbs. weight of *maize* to be equal in feeding value to 1 lb. of *bran*, the growing of this particular quantity of *maize* would save the farmer purchasing 14 tons of bran, and would therefore be one of the most profitable crops he could grow.

The great contrast in the yields of the different varieties of maize crops grown last season, as against the old methods of broadcast cultivation still practised by some dairymen is of such a convincing nature as to convert the most sceptical. In the foregoing pages, I record the results of this season's work with the variety and distance between rows of maize as against broadcasting seed on the farms selected by the Department in the area under my supervision. The testing of these two factors in the production of a suitable forage maize is of the most fundamental importance, as is evidenced by the difference in yield of different varieties when grown practically side by side, on the same class of soil, with identical cultivation and fertilization.

If carefully conducted experiments, such as the ones recorded, be carried out for about three years in succession there will be no difficulty in stating which would be the most advantageous distance between the rows with the varieties most suitable for early or late sowing, quickness of maturity, drought-resisting properties, and the ultimate value as a fodder of each variety; farmers generally would be induced to grow the most profitable varieties, and material assistance will have been rendered in increasing the area of this important forage crop throughout the State.

THE NITROGEN FOOD OF YEAST AND ITS BEARING ON THE MAKING OF FULL-BODIED DRY WINES.

F. de Castella, Government Viticulturist.

A new type of wine has been developed in Australia since the inception of our export trade in wine to London. The full-bodied dry wines which constitute the bulk of our shipments are different from anything produced in the wine countries of Europe, and in the making of them difficulties have to be surmounted which do not occur in the fermentation of wines of lower alcoholic strength.

The chief of these is to insure the conversion into alcohol of the last portions of the sugar contained in the must or grape juice. Yeast grows with difficulty in the presence of much alcohol; as the proportion of this substance increases the conditions of life become more and more difficult for its continued existence. Of recent years, the control of temperatures during fermentation has received considerable attention with most beneficial results to the quality of these full-bodied wines, but there is another point which merits attention and in connexion with which material aid can be given to the yeast plant. This is the amount of yeast food present in the fermenting mass, the exhaustion of which is in some cases responsible for the premature cessation of fermentation.

Yeast is a vegetable organism and, in common with other plants, its vital activity is not possible, unless a sufficiency of food be available. Being a fungus, it derives its carbon from the grape sugar instead of taking it from the air like higher, green leaved plants. Like these, however, it also requires a sufficiency of the three dominant plant food elements, nitrogen, phosphoric acid and potash. If any of these be deficient its growth must cease and fermentation remain incomplete, even though the alcohol contents are not sufficient to prevent a continuance of its life. Of these three elements, nitrogen is the most important; potash is present in ample quantities in the shape of cream of tartar, whilst phosphoric acid appears to be seldom deficient. Nitrogen, however, is not always abundant enough and, what is more important, a sufficiency of it is not always present in a form acceptable to the yeast plant, the requirements of which in this direction are peculiar.

THE IMPORTANCE OF AMMONIA.

In the must, nitrogen exists in several forms—chiefly as albuminoid substances, peptones, nitrates and ammonia salts. The last named is the form in which it is most readily absorbed by yeast. As fermentation advances, the amount of ammoniacal nitrogen present in the fermenting mass shows a progressive diminution. Nitrates appear to be quite useless to the yeast plant.*

M. J. Laborde, in an article dealing with the nitrogen contents of wine in the *Revue de Viticulture* of 1st October, 1898, writes—

Grape juice, like all natural sweet juices, contains nitrogen in a form essentially assimilable for a large number of microscopic organisms and especially for the yeasts of alcoholic fermentation. M. Duclaux† proved in 1866 that, apart from

* Paccotet, *Vinification*, p. 49.
† Sur l'absorption d'ammoniaque, &c., *Annales de l'Ecole Normale Supérieure*, I., II., 1866.

organic nitrogenous compounds (albuminoid substances and others), must contain small quantities of ammoniacal salts, and that, even in presence of readily assimil able organic nitrogen, yeast absorbs ammoniacal nitrogen with great ease, onl leaving a few milligrammes of ammonia in the wine, whereas the must containe as much as 120 milligrammes per litre.

In the same article he deals with the utility of organic nitrogen which though less readily absorbed, constitutes the greater part of the nitroger supply of the yeast—

Nevertheless, experiments prove that organic nitrogen is unable to thoroughly supplement the complete absence of ammonia under usual conditions of vinous fer mentation, and it is this that explains the almost invariably positive influence o: ammoniacal salts added to musts in order to increase the activity of fermentation.

In concluding, Laborde further states—

In a general way the ammonia naturally contained in must is greedily utilizec by yeast.

In the *Revue de Viticulture* of 20th July, 1901, M. E. Kayser dealing with the use of phosphate of lime in winemaking says—

Furthermore, ammonium phosphate seemed to produce more marked effects thai bicalcic phosphate; besides, we know from other experiments that ammonium phos phate produces an energetic action on the progress of the alcoholic ferment. M Martinand has shown us that a dose of 10 grammes per hectolitre (2oz. per 100 gallons of the latter salt was sufficient to invigorate a languishing alcoholic fermentation. even at low temperature. It is also known that slight traces of this salt enable the last traces of sugar in a wine to be transformed into alcohol.

Semichon in his *Traité des Maladies du vin*, p. 611, states that amongst yeast stimulants, ammonia salts, especially phosphates, which contain phosphoric acid as well as ammonia, hold first place. He describes the two principal phosphates of ammonia, viz., the mono-ammonia or acid phosphate, and the bi-ammonia or crystallized form. The acid reaction of the former is an advantage, in addition to its lower price: it is the one most frequently employed.

From the above references it will be seen that yeast most easily absorbs the nitrogen it requires in an ammoniacal form. The addition of an ammonia salt, towards the close of fermentation, at a time when the vitality of the yeast plant has diminished and when the proportion of ammonia salts present has been considerably reduced has, therefore, a powerfully stimulating action.

Almost any ammonia salt may be used but, as yeast requires phosphatic as well as nitrogenous food, phosphate of ammonium is to be preferred.

THE EFFECTS OF EXCESSIVE AERATION.

Pasteur showed long ago that yeast behaves very differently in the presence and in the absence of oxygen. In the former case it grows very actively, producing a large weight of its own substance at the expense of the sugar and other food substances at its disposal, but converting a relatively small proportion of sugar into alcohol. Under these conditions its vegetative growth is greater in proportion to its chemical activity. In the absence of oxygen, its growth is less rapid, but its fermental power is far greater. In other words, the quantity of sugar decomposed by a given weight of yeast is very considerably increased.

Excessive aeration, by bringing about the growth of a far larger crop of yeast, leads to an increased consumption of the plant food substances present in the must. In the case of high gravity musts, where there is much fermentation work to be done, this may result in the exhaustion

of the supply of nitrogen food present before fermentation has reached the requisite stage and whilst there yet remains an appreciable quantity of unconverted sugar in the wine. Owing to the very general use in our wineries of pumps which often aerate the wine considerably during fermentation, such cases must be of frequent occurrence. The artificial supplementing of the depleted ammonia contents of the grape towards the close of fermentation can then be of great service. Fermentation which had almost entirely ceased may be caused to recommence, insuring the production of a dry wine instead of a sweetish one which so readily falls a prey to the development of bacteria (parasitic ferments as they are termed in France) which render the wine unfit for anything but distillation.

PRACTICAL APPLICATIONS.

So much for theoretical views. The writer was much struck by the perusal of the above extracts, though somewhat surprised that more attention has not been devoted to the subject by recent French authors. It must, however, be remembered that in France the making of dry wine from such high gravity musts as we have to deal with in Australia is scarcely ever attempted. French musts seldom have a gravity of more than 10 deg. or 12 deg. Baumé (1.075 or 1.091 specific gravity). To cause these to ferment completely is a matter of little difficulty.

The fermentation of the wines required of us in London, for which the initial gravity of the must is usually about 15 deg. Baumé, is a vastly different matter. With such musts, and more especially in the case of even stronger ones, fermentation is apt to cease whilst the wine has a gravity of 1 deg. or 2 deg. Baumé, the unconverted sugar being a constant source of danger to the wine.

In the hope that the above considerations might be taken advantage of, and the last troublesome degrees of gravity be got rid of by the stimulation of waning fermentations by the addition of ammonium phosphate, some experiments were undertaken at the close of the 1906 vintage. Several vats of red wine, which had been separated from the marc, and in which fermentation had practically ceased, were treated. Ammonium phosphate, dissolved in a small quantity of water, was added at the rate of 1 oz. per 100 gallons of wine and well stirred in. The contents of the vat were then aerated by being pumped into a tub, the bottom of which was pierced with holes, through which the wine fell back into the vat. Aeration was continued for about ten minutes, the vat being then covered with a tarpaulin. After a couple of days, a fairly brisk fermentation was noticeable and, a few days later, a marked reduction in gravity was obtained. It was then racked into a cask, the bung-hole of which was closed by a sand bag; fermentation continued slowly, the wine eventually becoming dry.

Several vats were experimented on, the results being most encouraging. In some of these the initial gravity had been as high as 16 deg. Baumé and over, yet fermentation was complete, the final wine containing, in one case, as much as 31 per cent. of proof spirit.

In one or two of the vats, although a reduction in gravity was induced, the above dose of ammonium phosphate was not sufficient to complete the fermentation; a repetition of the treatment, however, followed as before by aeration, secured the desired result.

In all the above experiments the temperature of the vats was controlled during the earlier stages. It is scarcely necessary to point out that wine

from a vat which had become overheated at any period of fermentation could not, with any reasonable hope of success, be treated in this way the toxic substances excreted by the yeast at high temperatures would most probably render further fermentation impossible, even if the wine were not already invaded by bad ferments.

Care should be taken not to exceed the dose of 1 oz. to the 100 gallons in any one addition. Only sufficient phosphate should be used to secure the desired effect, and not enough to leave a surplus in the wine. If no more than the necessary quantity be employed it will be absorbed by the yeast, the development of which it has rendered possible.

It must be remembered that phosphate of ammonia can act as food for bacteria as well as for yeast. The danger of the presence of a surplus of this substance in the wine after the completion of fermentation is therefore evident.

The results obtained in the experiments described above were so satisfactory, that no hesitation is felt in recommending a trial of the process to viticulturists at the close of the coming vintage.

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Mr. James Lang, orchardist, Harcourt, has contributed articles on orchard work and management to the *Journal of Agriculture* for nearly six years. During that period information of a practical and safe nature has been placed before readers of the *Journal* who must have benefited largely where they followed the advice and instruction afforded. The tenor of the articles was of a nature calculated to materially assist fruit growers who were aware of the elementary principles and could and would apply them practically, being largely the result of the experiences and experiments of a fellow orchardist of long standing and splendid repute. It is on account of pressure of private business only, that Mr. Lang has ceased for the time being to be a regular contributor to the *Journal*.

In future the aim will be to continue on the same lines as Mr. Lang in regard to general notes of interest to fruit growers, and specially to include, as far as possible, items calculated to be useful to novices in the cultivation of fruit, which culture is often attended with a deal of imaginary difficulties. Fancy phrases and formulæ and bewildering technicalities will be avoided, with a view to reducing the matter to a simple form without departing from a correct basis. The kinds and varieties of fruits suitable for planting for home use or market in certain localities and soils, the type of tree, how to plant, prune, cultivate, avert or destroy diseases, insect and fungoid, and to utilize the product wisely will be the kind of information aimed at under the heading of "Orchard Notes." Capable orchardists—and they are numerous and well distributed over the State—do not need information of an elementary nature, but the beginners—and they also are numerous and scattered—do, and it is specially for their benefit, whether the product is designed for domestic use in the home or for the world's markets, that the subject is dealt with in this *Journal*.

Seasonable work in established orchards at this season includes the picking, and packing for market, or storing, of late apples and pears,

cleansing of bandages (used to trap codlin moth), and trunks of apple and pear trees; cultivating for green manuring, and draining, or otherwise improving the condition of soil where improvement is needed.

All fruit should be carefully handled, especially so if designed for export or long keeping. The best method of taking fruit from trees to the storing or packing rooms with the least possible crushing or bruising is as follows:—The fruit hanging pendant should be lifted up to break off the stem, not, as is often done, pulled in any direction, which is liable to cause the stem to leave the fruit, producing what is practically a wound that often induces decay. The fruit should be carefully laid in a basket or other vessel suspended by a hook to the branch which when filled should be taken to the cases and be carefully deposited therein to be conveyed with the least possible jolting to the packing or storing room. Many orchardists use a bag to pick the fruit into. The bag is attached by a strap to the waist of the picker, and when filled the fruit is taken to and carefully deposited in the cases. The bag system is attended with a deal of friction and the bloom is generally rubbed from the fruit. The basket or, as a substitute, a kerosene tin with one side taken out and a wire handle attached, seems to be the best method.

Fruit intended for export to distant countries should be carefully selected, graded, wrapped in paper and firmly packed. Good typical specimens, well coloured, of moderate size and firm texture, should be chosen. Any fruit showing traces of "bitter pit," or in a gross overgrown condition likely to produce that disorder should be placed aside for immediate use or sale. An exceptionally heavy crop of apples has been produced this season, and this fact, together with the character of the season, which has been unfavorable to a large consumption of fruit, has resulted in low prices for fruit of fair quality in the local markets. Still a grower has no option but to sell his fruit at once, even at low rates if it is likely to become "pitted." Many varieties of apples will keep well, if handled as advised for export, and should be retained until the bulk of the earlier fruits is consumed. Rome Beauty, Rokewood, Yates, and other varieties will keep until August and September, if carefully handled and stored in cases in a room of regular, even if not of low, temperature.

When the fruit is all gathered, the bandages should be taken from the trees and be either boiled or burned. Good stout bagging is needed for an effective trap for codlin moth and any that answers that description should be boiled and put away for future use. Thin, old, or rotting bands should be burned at once. The trunks of most trees afford a hiding place for codlin moth "grubs" under the bands and in other places. The places likely to harbor the pest should be examined and all grubs be killed. Bands are often examined and cleansed, and replaced, to remain on the trees during winter. This is not good practice as the bands act as a shelter and harbor for red spider and other pests in various stages.

Where a soil is deficient in organic matter, and stable manure is scarce, or expensive to haul, a crop of peas grown during winter and ploughed in early in spring is the best means to supply the desired element of fertility. Land should be ploughed at once and cultivated well to insure a good crop of peas. Manure should be carted and spread to be ploughed in later in season. In some of the best orchards in the Doncaster district, new soil is carted at considerable expense and used as a top dressing for places where the trees are in full bearing. A remarkable result has been obtained in many places by the addition of fresh soil, superior to that following the use of stable manure. Hard and poor patches of soil should receive special attention in this direction.

PROCLAIMED HEDGE PLANTS.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist.

Surprise is often expressed that certain hedge plants should be on th list of proclaimed plants and that being on the list no steps are taken to insure their complete suppression.

This applies to such plants as Gorse, Cape Broom, English Broom Acacia-hedge, and Box Thorn all of which are more or less useful hedg plants under special conditions, or, in the case of Sweet Briar and Black berry Bramble, do little harm in hedges, although highly obnoxious i allowed to run wild. Strictly speaking, the Act requires the complet eradication of proclaimed plants, but where a hedge plant is proclaime to prevent its undue spread on pasture and other land, common sense deter Thistle Inspectors from doing more than to demand that, where an estab lished hedge exists of a proclaimed plant, it shall be kept properly cu and trimmed within reasonable limits such as 3 feet broad and 6 fee high.

The only cases in which the Thistle Act needs to be applied to hedg plants in all its stringency, would be where the hedge contains plants whicl are directly injurious or poisonous and apt when abutting on public road to affect passers-by or stock to their detriment.

As is well known, the administration of the Thistle Act is in the hand of the Shire Councils, the functions of the Agricultural Department bein mainly to give advice and to see that no mistakes are made either a regards identification, or as to the plants proclaimed. The usual wa in which a plant becomes proclaimed for the whole State, is that some shi applies for its proclamation within their district. After an examinatio of the plant and a report as to its properties, history, powers of spreading &c., proclamation is granted if the plant appears to be a really dangerou one. Usually the first proclamation is followed by requests from othe shires from time to time for the extension of the proclamation to withi their boundaries. As soon as the plant has in this way been proclaime for a number of shires, it is then proclaimed by the Department for th whole State, provided that doing so appears likely to prevent or retar further spread, or, in the case of a hedge plant, to check its introductio to districts for which it is not suited or where it is likely to prov dangerous. The whole of the plants mentioned above have been proclaime in this way.

Gorse for instance was separately proclaimed for no less than 5 shires before being proclaimed for the whole State. An important reaso for uniformity in such cases is that, where a plant is widely proclaimec there is a manifest injustice to every land-owner in a proclaimed shi whose property borders on a shire where a plant, proclaimed in his shire grows but is not proclaimed.

Private individuals rarely take action under the Act, but the sting o the injustice is removed when the individual has the power to take actio if he thinks fit to do so.

Apart from the true thistles, barely half-a-dozen plants have bee directly proclaimed by the Department for the whole State, and thes have been all plants well known as poisonous (Hemlock &c.) or a dangerous weeds (Dodder, Bindweed &c.). Naturally, an introduced pla known to have great powers of spreading and to be difficult to eradica is more readily proclaimed than a native one already spread widely ove the State. Thus *Erechthites quadridentata*, the so-called Cotton weed,

in some parts as great a nuisance as any of the proclaimed plants, but it is a native nuisance and the only practical means of suppressing it is by the continued extension of cleanly cultivation and the spread of closer settlement. On the other hand, Box Thorn (*Lycium horridum*) was originally recommended by Baron von Mueller for introduction as a hedge plant, and has been largely used in many parts of the State for this purpose.

The plant is easily established. It is impenetrable to stock, stands drought and exposure to strong winds extremely well, is resistant to grass fires, and has therefore many of the strongest recommendations for a hedge plant in dry wind-swept districts. On the other hand, if neglected, the plant soon forms an impenetrable jungle which cannot be destroyed by fire while standing and is too dense to roll flat and burn. The roots of a single plant may extend 20 to 30 feet laterally, so that they will draw moisture from the crop to a large extent round the edges of every field. The thorny character and irregular growth of the plant make it very difficult, and even dangerous, to cut. Several cases of blindness have occurred through a thorn entering the eye and even on entering the flesh it makes a painful wound, being probably slightly poisonous. The plant fruits abundantly and the seeds are spread far and wide by birds.

Box Thorn soon showed such signs of becoming a dangerous pest that the Shires of Bacchus Marsh and Melton applied for its proclamation, which was granted in 1904. In 1907, after the receipt of a further request for proclamation from the Shire of Bairnsdale where the plant was proving troublesome, it was proclaimed for the whole State, to hinder its spread into sparsely settled districts. Altogether the plant is a highly dangerous one to use in sparsely settled districts and it soon turns neglected or abandoned homesteads where it has been used for hedges into a vermin protecting jungle, which can only be destroyed at considerable cost. Even around the shores of Port Phillip Bay, this plant appears to be spreading fast and it will be a matter of the deepest regret if the pleasant groves of tea-tree along the coast become surrounded and interspersed with an objectionable scrub of this character. Every fire, and every neglected clearing, will give it a fresh opportunity for encroachment unless it is kept under control. Prickly Cactus was recently approaching this district along the railway lines and might have done much damage, but for the prompt action of the Railway Department.

If we are to judge from the context and from the practical application of the Thistle Act, its purpose is not so much to force a land-owner to keep his land clean and free from weeds as to prevent him from allowing such plants to flourish upon it as will be dangerous to or inflict damage upon his neighbours. From this point of view Gorse, Broom, Acacia-hedge (Prickly Acacia), Box Thorn, &c. could all be used for hedges without infringing the spirit of the Thistle Act, provided they are kept cut and trimmed and not allowed to exceed 6 feet high by 3 feet broad. There would then be practically no danger to neighbours nor would such hedges be anything but useful to the land on which they grew.

Hedges or stone walls, or turf banks are far better boundaries to a land than wire fences. They act as wind breaks, checking sand drifts and dust storms, they give shelter to stock, they help to arrest the spread of floating seeds of many weeds, and the spores of parasitic fungi. Like fire, however, which is a blessing or curse according to whether it is under control or not, so also do many useful hedge plants become curses, if allowed to spread unduly. An untrimmed hedge full of gaps, irregular in height and flowering and seeding profusely is not only a useless drain

on the land on which it grows but is also a danger to neighbouring land, if it seeds freely and is prickly, or poisonous, or obnoxious in any way.

The only means of keeping such plants within bounds is by proclaiming them as noxious pests, which has accordingly been done. Speaking without prejudice and from a purely botanical point of view absolute extirpation is unnecessary in the case of any non-poisonous plant used for hedges, but it is a moot point whether the State would not have been better off had Gorse, and Box Thorn never been introduced. No such reservation applies to Dodder, Bindweed, Thistles, Bathurst Burr, or St. John's Wort, &c., but many days are likely to pass before these plants become rare curiosities grown only in Botanical Gardens as living mementos of the neglect in early days which allowed such objectionable aliens to freely enter and colonize a fertile country.

THOUSAND HEADED KALE.

H. W. Ham, Sheep Expert.

We are obliged to a correspondent for suggesting a short article on kale as a fodder plant for use by farmers in fattening ewes and lambs.

Kale is more a plant to be plucked of its leaves and sprouts, and hand-fed to stock, than to be grazed off. It is very suitable for small patches of rich soil in good rainfall and cool districts. To pluck the sprouts and leaves for large numbers of sheep and lambs is, with our present labour conditions, out of the question.

THOUSAND HEADED KALE.

It is not as suitable for wholesale cultivation as rape; it takes longer to establish, is slower coming to the feeding stage, and will not do so well on average quality or plain clayey land, and besides, is very liable to blight at the first approach of warm weather.

Broadly speaking, rape and oats, for the reasons explained in the January number of this *Journal*, is the best fodder crop for sheep work.

As compared with rape, kale does not go very rapidly into seed. The latter, when first showing, can be cut off and fed to stock; the plant then throws out additional sprouts and will last another year. For paddock work, this does not suit; the ground would be more profitably used for a clean grain crop during this time, and besides kale cannot compare with a mixture of rape and oats for bulk of fodder on ordinary grain growing land.

Rape is the most fattening plant, except in its early stages, when it is more likely to scour and, in wet weather, to blow stock. But any very green feed, especially in showery weather, will scour sheep that have been poor for a long time, and have consequently weak stomachs. It does not pay to put poor sheep straight on to very green fodder crops; grass for a time to start them into a thriving condition is preferable. The richer and more succulent the feed, the more likely it is to scour weak sheep. Kale is a warmer tasted plant than rape, except, perhaps, during the warm weather of spring. In rich soil, and a liberal rainfall, kale will grow to 5 and 6 feet high, and if cultivated between the rows, will give a surprising amount of fodder.

It is of value for keeping stock in good health through the summer, and especially for feeding to sick animals at this time of year.

The writer has found kale most suitable for growing in very small rich paddocks, but not for field planting. An acre or less of it, well manured, with plenty of water, either by irrigation or rainfall, will last two years, and a bag of leaves and sprouts to throw over the fence to milking cows or stud sheep can always be obtained.

On the farm of Mr. W. H. Yelland, at Newlyn, near Ballarat, the writer recently saw kale and chou moellier growing side by side under similar conditions. The kale was not so tall, but it had a greater number of sprouts and gave every appearance of producing more feed per acre.

Mr. Yelland speaks well of kale in his rich soil and, with such a generous rainfall, he can pull a few bags of leaves and sprouts for his stud Romney sheep or Hereford cattle every day through the summer.

MANAGEMENT OF EWES.

H. W. Ham, Sheep Expert.

Several correspondents are inquiring about crutching ewes, trimming feet, and whether cold affects the supply of milk when woolly udders are cleaned.

There are several reasons why ewes get fly-blown, and need crutching. With special stud weaners, it is the excessive wool covering that is often not well shorn away (coupled with folds) that retains the urine and gives the maggots something to live in. Flies will blow nearly anything, but maggots cannot live without moisture. With stud weaner ewes after shearing, it is sometimes scald that attracts the flies, and produces conditions under which the maggot can thrive.

In all classes of weaners of either sex, black scour, caused by the presence of worms, is the most difficult to manage. To clear the worms by rape feeding and drenching is the first step towards prevention of fly-blow in this class of sheep.

In the autumn, just before lambing time, ewes in some districts get struck very badly. At this stage, in-lamb ewes, (especially if a flush of green picking has come), pass a secretion, that is both an attraction for flies and a home for maggots.

Lambing ewes, of course, offer special attractions to flies, for if not crutched the cleanings and urine get caught in the wool, and the better the class of sheep from a wool-cutting point of view, the more trouble is found. If the wool is previously cut away, there is less likelihood of there being anything retained for the maggots to work on. In timber country, flies are most active and plentiful during the calm, warm weather after the first autumn rains.

If showers keep the ewes damp after being blown, the maggots spread rapidly, and will go up over the back in a very short period. Fresh larva is deposited by flies at every opportunity during this time.

The action of powder dips is both to dry up the stain and moisture about the tail parts, and to check the spread of maggots that may later on be deposited there. The powder falls among the new growing wool, and in many cases prevents the larva living. Strong bluestone wash is effective; it dries up the moisture, and is deadly to maggots, but has not the lasting effects of a finely ground powder dip at three or four times the ordinary strength.

With aged ewes, especially if of the plain bodied bare pointed class, it will be sufficient if the tail parts are done, but in young Lincoln-merino ewes, it is at times necessary to remove the wool from all woolly udders, as the lamb in cold weather undoubtedly gets a better chance on first rising to its feet. Many lambs from maiden ewes are lost on cold nights, owing to their sucking locks of wool and yolk fribs instead of the teat. After the ewes are well crutched (unless the country where they are located is very bad for flies), it is not necessary to put on any of the powder dips.

About six weeks before lambing commences is the usual time for crutching. It is rather dangerous later, especially with men who are careless or inexperienced in the way of setting them down.

Feet trimming is usually done once a year on the shearing board, and at any time when an odd ewe is seen in the yards through the year. Under certain conditions, it is necessary to keep them trimmed, for it is a preventative of footrot in some soils to have the hoofs steadily growing and kept short. In gritty country they keep their hoofs well worn by walking about, and consequently need very little attention.

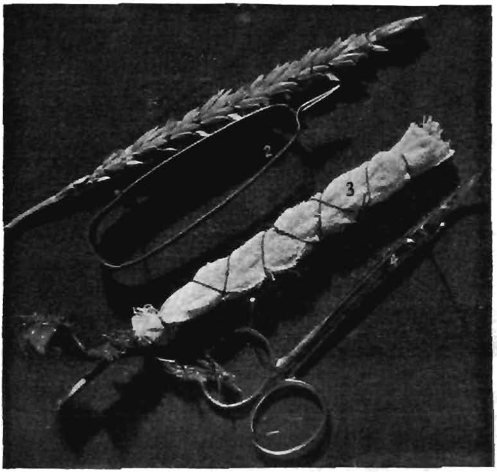
The cold getting to the udders when the wool is cleared away does not affect the milk yield to any extent, although some farmers who have crutched their ewes maintain that it does. As a rule, ewes are poor about crutching time. Poverty, and scarcity of good, milk-giving feed, affects the milk yield most. If ewes are kept strong, as they should be at this time of the year, there is no need to fear that the milk yield will be affected. Ewes of the Border Leicester type have no wool at any time about the udders and they are the best of milkers—the cold gets to them. Ewes, when cleaned about the udder and tail, seem to be better milkers on that account.

Many sheep breeders often allow their ewes to get too low at this time of year to have a successful lambing. Ewes heavy in lamb should be kept strong. They may look well to a casual observer, but it is the lamb inside that makes them appear full and in fair order, but who has not noticed how very poor ewes are when the lamb comes away in April and May.

REPORT OF WHEAT IMPROVEMENT COMMITTEE.

F. E. Lee (Agricultural Superintendent), Hon. Secretary.

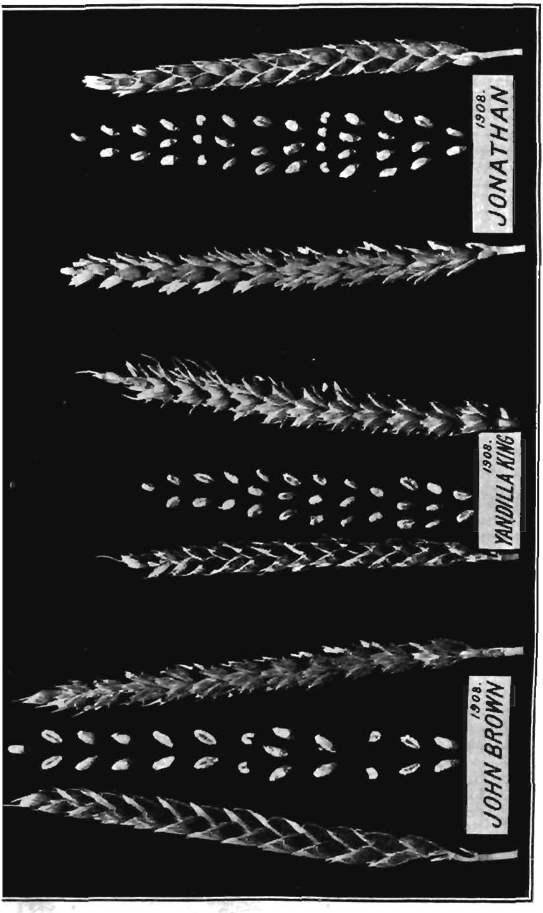
The necessities of the wheat growing industry are so obvious, and the extension of the area under this crop of such paramount importance to the State that the creation of a departmental Committee to investigate the associated problems needs no justification. It has been realized for some time that the co-operative experiments with farmers leave a great deal to be desired as far as scientific inquiry is concerned. The problem of improving



APPLIANCES USED IN THE CROSS-FERTILIZING OF WHEAT.
1, Ear; 2, Forceps; 3, Ear protected from foreign pollination; 4, Scissors.

the State yield of wheat is capable of solution through several channels, viz., improved methods of soil preparation and crop rotation, rational fertilization, and by the introduction of wheat varieties especially fitted to meet the soil and climatic conditions peculiar to northern Victoria. It is with this last aspect that the work of the Committee will be most concerned for the next four or five years.

The Director of Agriculture (Dr. Cherry), the Vegetable Pathologist (Mr. McAlpine), the Principal of the Dookie Agricultural College (Mr. Pye), and the Agricultural Superintendent (Mr. Lee) constitute the Wheat Improvement Committee, which is charged with the initiation and conduct of a comprehensive scheme for the breeding of new wheats which shall combine as far as possible the desirable characteristics of numerous varieties,


1908. JONATHAN
1908. YANDILLA KING
1908. JOHN BROWN

and which shall be capable of producing good yields in any season of normal rainfall. At first sight, it appears difficult to reconcile the somewhat conflicting view points of the farmer, the miller, and the baker. The farmer, under existing circumstances, unhesitatingly gives priority to the varieties which will fill the most bags per acre. The miller looks for a wheat which will mill easily, and produce a large percentage of flour of good colour. The ideal of the baker is to procure flour which will produce the greatest number of loaves per ton of flour, with a minimum of difficulty in handling. The evidence ascertained by the Committee during the last season adds weight to the opinion advanced by wheat experimentalists generally, that yield and quality do not always go hand in hand. In other words, the most prolific yielding varieties are generally to be found among the "weak flour" types of wheat.

The question of whether quality should be subordinate to yield depends on whether the inquirer is a farmer or a baker. The Committee clearly recognises that, for the present at all events, the prolificacy of any variety, new or old, transcends in importance all other factors. Every effort is therefore being made, both by means of selection and cross breeding, to achieve success in this direction. At the same time, factors of equal importance, such as quality of flour, and resistance to disease, are being carefully investigated, with the view of ultimately associating them with a variety of high yielding capacity.

The work of the Committee embraces ten-acre stations at Dookie College, supervised by Mr. Pye, and 10 acres each at the Government Farms at Wyuna and Rutherglen, also 50 acres for breeding plots and for the provision of seed for sale at Longerenong College, the three last being controlled by Mr. Lee.

At Longerenong, the field operations are under the care of Mr. J. T. Pridham, who has had the benefit of three years' training under the late Mr. Wm. Farrer, at Queanbeyan, and latterly at the Government Wheat Experimental Farm, at Cowra, New South Wales. Mr. Pridham has furnished the Committee with most of the tabular matter included in this report.

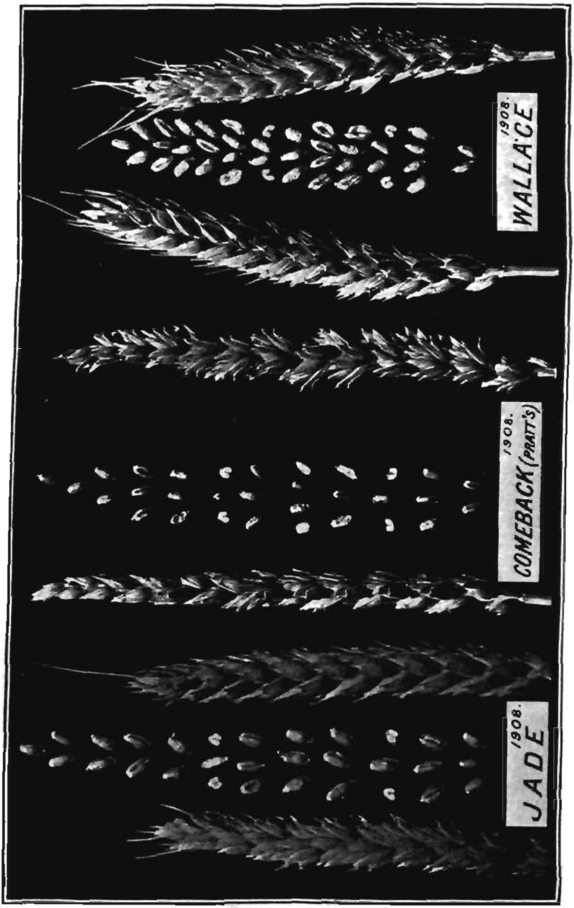
FIELD OPERATIONS AT LONGERENONG.

Five acres were set apart for single rows of all procurable varieties of wheat. From these rows, typical plants were selected for crossing purposes. Every facility was given, by hand-hoeing and weeding, to enable the plants to attain their maximum development, so that the parents of all hybrids were thoroughly matured. Nearly 70 cross fertilizations were carried out, the objectives being:—

(*a*) To increase yield.
(*b*) To reduce straw.
(*c*) To minimize smut liability.
(*d*) To affect period of maturity.
(*e*) To improve capacity to hold grain.
(*f*) To improve rust resistance.
(*g*) To strengthen straw.
(*h*) To improve milling quality of grain.

PERIOD OF MATURITY.

Upon this factor a good deal often depends. A late maturing wheat is more liable to the effects of dry weather, which may cause the grain to pinch, or to the effects of storms which may destroy the crop entirely by beating out the grain. A too early wheat may interfere with the hay harvest. Generally speaking, it seems likely to be established that those


1908.
WALLACE
1908.
COMEBACK (PRATT'S)
1908.
JADE

varieties which mature in early mid-season as, for example, Federation, College Purple Straw, Wallace, Jade, and others, give the highest average yields.

The following table shows some interesting comparisons between the periods of some familiar varieties :—

Variety.	Date Sown.	Date of *Heading out.*	Date Ripe.	No. of Days between *Heading out* and Ripeness.	Total Days to arrive at Maturity.
Bunyip	June 1 ...	Oct. 15 ...	Dec. 6 ...	52	188
Florence	" ...	" 24 ...	" 8 ...	45	190
Comeback	" ...	" 26 ...	" 8 ..	43	190
Federation	" ...	" 31 ...	" 14 ...	44	196
Jumbuck	" .	Nov. 2 ...	" 19 ...	47	201
Plover	"	" 2 ...	" 19 ...	47	201
Jade	" ..	" 2 ...	" 16 ...	44	198
John Brown	" ..	" 4 ..	" 20 ...	46	202
Bobs	" ..	" 4 ...	" 16 ...	42	198
College Purple Straw ...	" ..	" 6 ...	" 18 ...	42	200
Yandilla King ...	" ...	" 7 ...	" 22 ...	45	204
Australian Talavera ...	" ..	" 9 ...	" 21 ...	42	203
Marshall's No. 3 ...	" ...	" 10 ...	" 23 ...	43	205

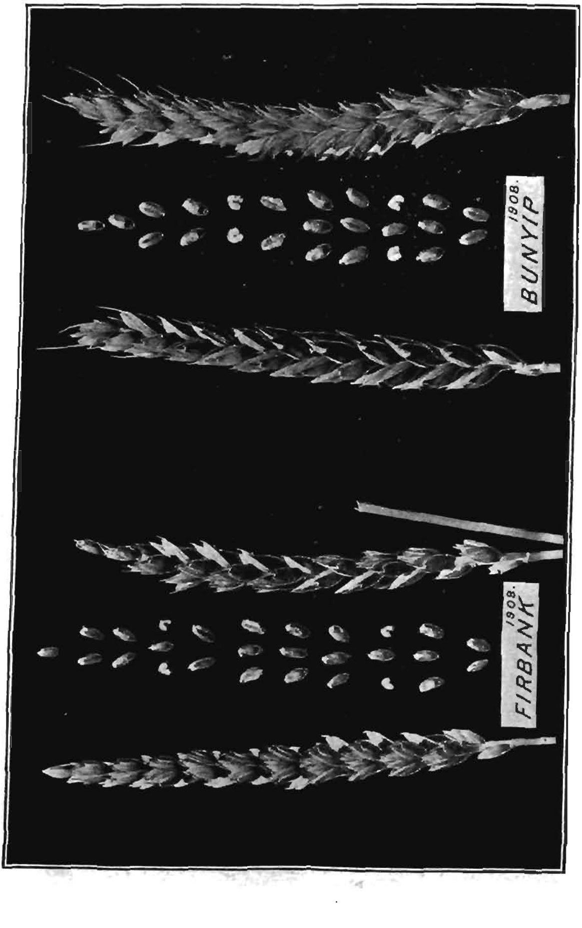
DROUGHT RESISTANCE.

Ability to withstand the not infrequent dry conditions in Northern Victoria consitutes a most important factor in deciding the suitability or otherwise of varieties for certain districts. The most noticeable effects of dry weather are withering of the tip of the ear and the pinching of the grain. The table below throws some interesting light on the subject :—

Variety.	Absence of Tip-withering. 5 Points.	Plumpness of Grain. 5 Points.	Total Points for Drought-resistance. 10
Bunyip	5	5	10
Bobs	5	5	10
Comeback	5	5	10
Plover	5	5	10
College Purple Straw ...	5	5	10
Dart's Imperial	5	5	10
Federation	5	4	9
Florence	5	4	9
Jade	5	3	8
Jumbuck	2	4	6
Australian Talavera ...	2	3	5
Yandilla King	1	2.5	3.5
John Brown	1	2	3
Marshall's No. 3	1	2	3

QUALITY OF GRAIN.

Critical observations have been made regarding the quality of the grain. Plumpness is highly desirable from the farmer's stand-point, whereas hardness concerns the miller more particularly, and translucency, which is usually held to indicate flour value, is interesting to the baker.


1908.
BUNYIP.
1908.
FIRBANK.

QUALITY AND YIELD.

Variety.	Quality of Grain.			Yield.	Total Points, representing Quality and Yield.
	Plumpness. 5 Points.	Hardness. 5 Points.	Translucency. 10 Points.	50 Points.	70
Yandilla King ...	2·5	3·0	6·0	50·00	61·50
Florence	4·0	4·0	9·0	41·11	58·11
Dart's Imperial ..	5·0	2·0	3·0	46·61	56·61
Comeback	5·0	4·75	9·0	36·46	55·21
Federation	4·0	2·5	3·0	44·03	53·53
Jumbuck	4·0	3·5	9·0	35·44	51·94
Australian Talavera ...	3·0	3·0	7·0	36·25	49·25
Bobs	5·0	4·5	9·0	30·37	48·87
Plover	5·0	2·5	4·0	33·12	44·62
College Purple Straw ...	5·0	2·5	2·0	32·74	42·24
Jade	3·0	2·5	5·0	30·75	41·25
John Brown	2·0	2·5	4·0	31·89	40·39
Bunyip	5·0	2·5	6·0	26·43	39·93
Marshall's No. 3 ...	2·0	2·75	6·0	27·53	38·28

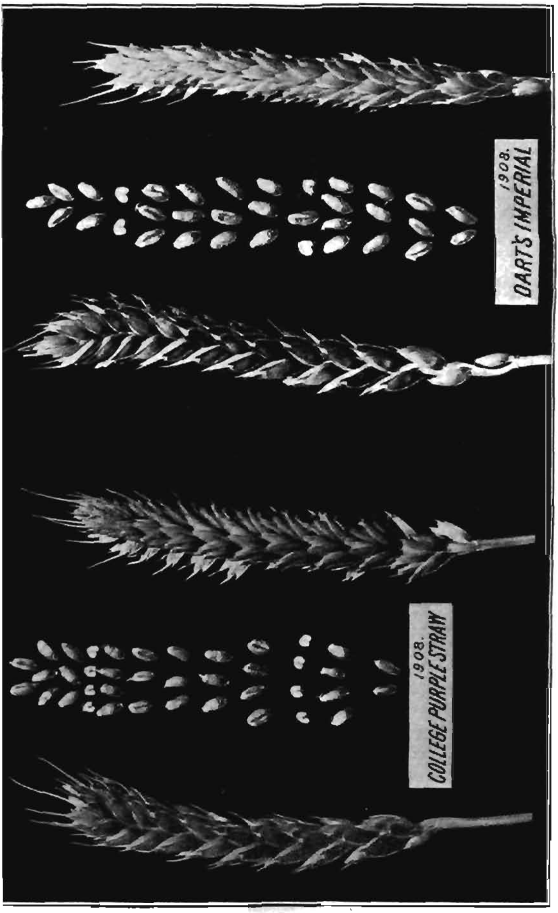
SCORE OF POINTS.

Reviewing some of the many characteristics which have to be taken into consideration when comparing wheat varieties with one another, it will be noted that the table below allows for strength of straw and capacity to hold grain. Both these factors are of supreme importance and while the only means which have been adopted to arrive at the determinations set out have been the test of the season itself, I have every confidence that succeeding seasons will confirm in the main the following conclusions:—

Variety.	Yield of Grain.	Quality of Grain.	Drought-resistance.	Power to hold Grain.	Rust-resistance.	Strength of Straw.	Total No. of Points.
	50	20	10	10	5	5	100
Yandilla King ...	50·00	11·50	3·50	8·00	4·00	5·00	82·00
Dart's Imperial ...	46·61	10·00	10·00	8·00	2·00	3·00	79·61
Florence	41·11	17·00	9·00	2·00	5·00	3·00	77·11
Comeback	36·46	18·75	10·00	4·00	4·00	3·00	76·21
Federation... ...	44·03	9·50	9·00	8·00	3·00	2·00	75·53
Jumbuck	35·44	16·50	6·00	8·00	2·00	3·50	71·44
Australian Talavera	36·25	13·00	5·00	8·00	4·00	4·50	70·75
Plover	33·12	11·50	10·00	8·00	3·00	4·00	69·62
Bobs	30·37	18·50	10·00	4·00	4·00	2·50	69·37
College Purple Straw	32·74	9·50	10·00	8·00	2·00	4·00	66·24
Jade	30·75	10·50	8·00	8·00	2·00	3·00	62·25
Bunyip	26·43	13·50	10·00	6·00	4·00	1·00	60·93
John Brown ...	31·89	8·50	3·00	7·00	4·00	3·50	57·89
Marshall's No. 3 ...	27·53	10·75	3·00	9·00	3·00	4·00	57·28

QUANTITY VERSUS QUALITY.

While it is freely admitted that the prime essential in a wheat must be prolificacy of yield, the character of the flour to be made therefrom must always exercise a potent influence on the commercial value of wheat. It is not to be wondered at that farmers decline to grow the hard-grained varieties which are well known to be better flour producers, seeing that until within the last year or two no difference has been made in the price


1908.
DART'S IMPERIAL
1908.
COLLEGE PURPLE STRAW

per bushel. It may be mentioned, as evidence of the growing knowledge in connexion with the question of the milling values of different wheats, that several millers in Victoria are paying 3d. per bushel over current market rates for Bobs wheat this season. There are other varieties of equally good flour strength, and possessing improved characteristics to Bobs, which should become popular with farmers, if an additional price becomes general. The most promising of these now being grown in Victoria is Comeback. It has the merit of being an early variety, and should prove a good yielder in the moist districts.

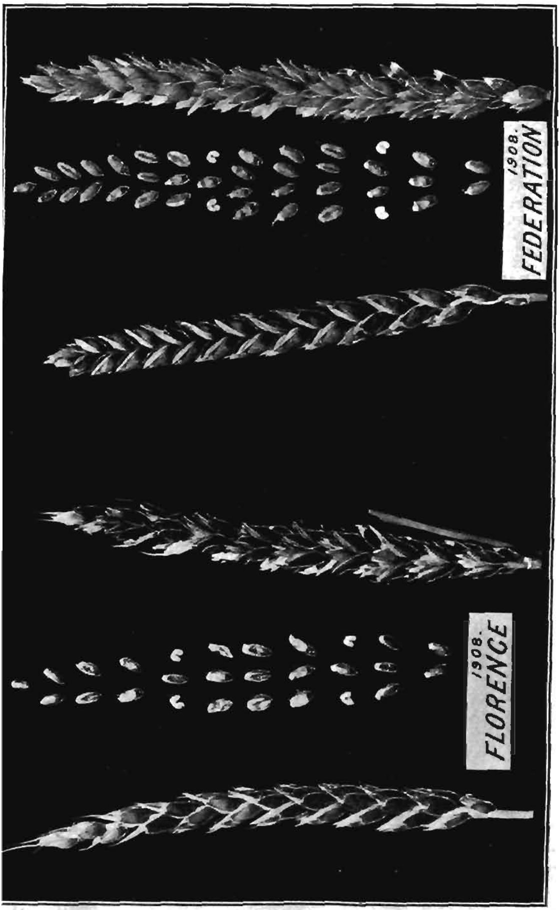
The softer-grained or weak-flour class.		The harder-grained or strong-flour class.	
Variety.	Total yield in drams of the best six plants.	Variety.	Total yield in drams of the best six plants.
Dart's Imperial ...	66·00	Florence	58·50
Wallace	67·25	Comeback	51·75
Yandilla King ...	71·00	Jonathan	50·33
Federation	62·50	Bobs	43·12
College Purple Straw ...	46.50	Genoa	42 10
Average ...	62.65	Average ...	49·16

Milling Values of Wheat Varieties.

As has already been intimated, the question of quality in wheats is not being lost sight of in the investigations under review in this connexion. The Wheat Improvement Committee is installing a miniature flour milling plant for the purpose of carrying out systematic tests of all varieties grown upon different types of soil. The flour derived from the miniature mill will be submitted to working bakers for manufacture into bread, so that a practical opinion may be elicited from the baker as to the actual value of any variety grown under certain known conditions. It is not too much to expect that within the expiration of a year or two the accumulated information will be most valuable as a guide to the class of wheats best suited to certain localities.

From a miller's point of view, the percentages of flour, pollard, and bran which can be derived from any variety, influence its value to a certain extent. From a baker's stand-point, the strength of the flour, the amount of water that the flour will absorb, as well as the proportion of gluten, are factors indicative of quality. The table below gives the percentage of mill products, gluten, and strength of some familiar varieties :—

Variety.	Per cent. Flour.	Per cent. Pollard.	Per cent. Bran.	Colour of Flour.	Per cent. Gluten.	Strength of Flour.
						Quarts.
Australian Talavera ...	73	10	17	Excellent	11	51
Bobs	70	15·5	14·5	,,	11	54
Dart's Imperial ...	72	14	14	,,	11	48
Comeback	70	15	15	,,	13	56
Federation	71	14·5	14·5	,,	12	52
Jade	72	13	15	Very good	10	49
John Brown ...	70	15	15	Excellent	12	51
Jonathan	71	14	15	,,	13	56
Marshall's No. 3 ...	73	13	14	,,	12·5	51
Yandilla King ...	70	15·5	12	Good	14·5	48


1908.
FEDERATION
1908.
FLORENCE

CHARACTERISTICS OF VARIETIES.

In order that readers may learn something of the general characteristics of some of the varieties dealt with in this report, the following brief descriptions may be of interest :—

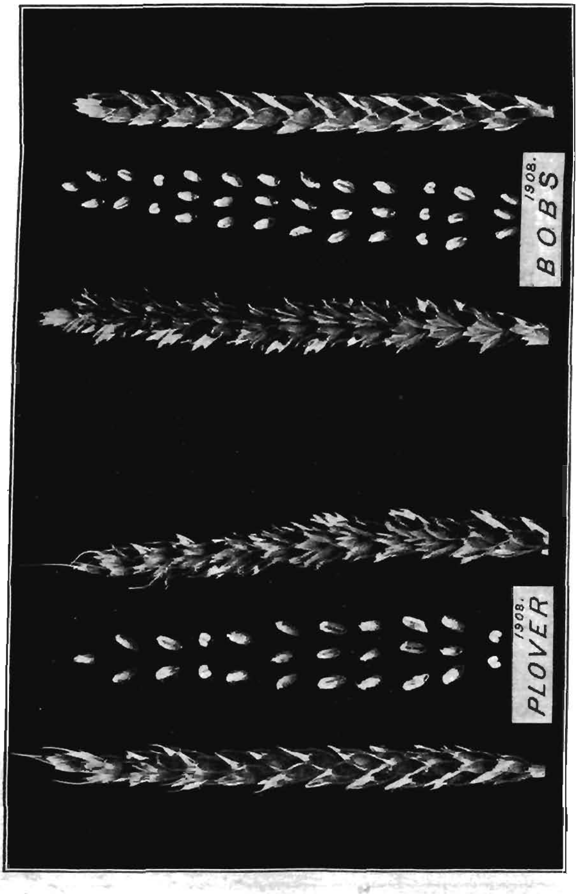
Bobs.—Stated to be a cross between Blount's Lambrigg and Nepaul barley, susceptible to frost if sown too early. A quick grower, fair yielder, drought and rust resistant. Has a slight tendency to shell. Produces tall straw of excellent quality. A good hay wheat. Ears good size, white, bald, grain rather exposed. Grain is small, white, plump, hard, and translucent.

A PLOT OF COMEBACK.

Bunyip.—Is a cross between Rymer and Maffra, the former having Fife and Purple Straw blood. A remarkably early ripening variety, producing plump grain when all other varieties show pinched grain. Not a particularly heavy yielder as a rule. Escapes rust, but somewhat liable to smut. Straw rather short and harsh for hay. Ears medium size, white, bald, holds grain well. Grain of good size and attractive appearance.

College Purple Straw.—A variety created by Mr. Pye from crosses between Dart's Imperial, Purple Straw, and Fife-Indian varieties. A prolific early mid-season variety, drought resistant, and holds grain well. Straw somewhat short. Likely to be liable to smut. Ears tip bearded, rather short, broad, and clubbed. Not liable to shell easily.

Comeback.—Created by the late Wm. Farrer, from Fife x Fife-Indian x Indian varieties. An early ripening, fairly prolific wheat. Drought resistant, and withstands rust and smut fairly well. Produces a very vigorous growth early in the season. Slightly inclined to shell. Straw medium height and good quality. Ears medium to small, tapering, white, and bald. Grain small, white, plump, and hard.


1908.
BOBS
1908.
PLOVER

Dart's Imperial.—Originating from a selection made by Mr. Thomas Dart in South Australia. Of the Purple Straw type, but rather later to ripen than most of that family. Rust liable, but stands drought well, and suits hot climates. Stools freely, and gives good results for hay or grain. Strips well and holds its grain satisfactorily. Straw strong and stiff, good height, and purple in colour. Ears tip bearded, white, medium size, clubbed tip. Grain fair size, white, plump, rather long and soft.

Federation.—A cross between Purple Straw and Fife-Indian varieties. An early ripening, drought resisting variety, yields most prolifically, and holds grain well. Suits almost any district. Is unsuited for hay on account of shortness of straw. Is smut liable. Straw short, strong, and harsh for hay. Ears brown in colour, good size, bald, square, and compact. Grain fair size, white, plump, and soft.

Jade.—A cross between Purple Straw and Early Baart. An early wheat, stools freely and yields well. Very rust liable. Does not shell. A good hay wheat, but liable to lodge badly in wet or windy weather. Liable to make too much straw on good soils. Liable to smut. Straw tall and weak. Ears tip bearded, good size, and white. Grain large, white, plump, and soft.

John Brown.—A cross containing two Fife varieties, Australian Talavera, and other varieties. Fairly heavy yielder, fairly drought resistant. Holds grain well. A good hay variety, but liable to bunt and smut. Straw tall and strong. Ears brown in colour, rather slender and long. Grain large, long, yellowish, and medium soft.

Jonathan.—Contains several strains of Fife, with Indian blood. Rust resistant, but does not stand drought well. Holds its grain splendidly, and easy to strip. Fairly smut resistant, and grain of excellent quality. Straw tall and slender. Ears white, bald, and tapering.

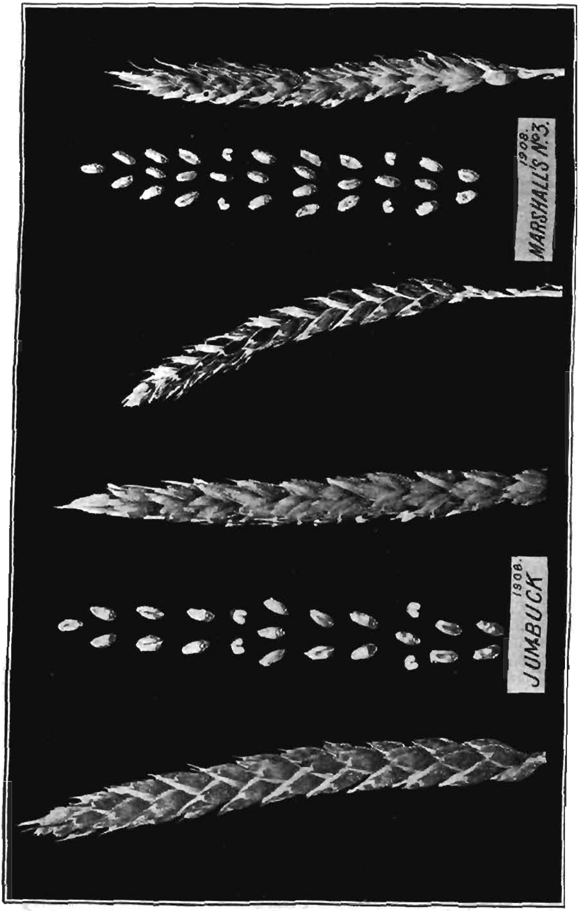
Jumbuck.—A cross between Fife x Tardent's Blue x Australian Talavera. A mid-season variety with rather tall straw and abundant flag. A good hay wheat, but liable to rust and smut. A very vigorous grower and stands drought fairly well. Not remarkable for yield of grain. Ears good size, woolly, and white. Grain fairly large, white, plump, and medium hard.

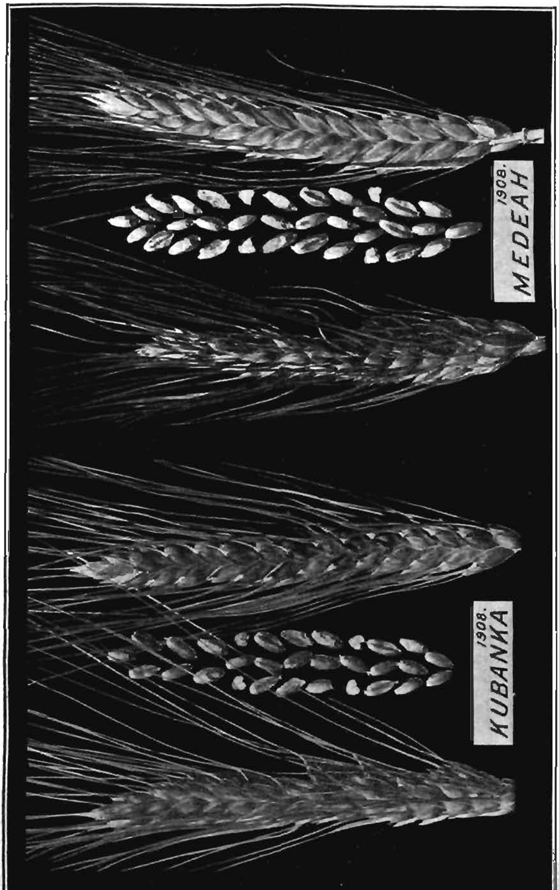
Marshall's No. 3.—Derived from Ward's Prolific, by Mr. Marshall, of South Australia. A fairly rust resistant variety, matures in late mid-season, fairly prolific yielder. Does best in cool districts. Holds its grain well. Straw rather short, strong, and purple in colour. Ears white and long. Grain fairly large, white, and medium soft.

Yandilla King.—A cross between Yandilla and Silver King created by Mr. Marshall, of South Australia. A rather late maturing variety, but prolific yielder of grain. Stools heavily and holds grain well. Fairly drought resistant. Liable to smut, but should resist rust fairly well. Straw on the short side, but otherwise strong and good quality. Ears slightly tip bearded, large, and rather long. Grain fairly large, fairly plump, and medium hard.

Wallace.—A cross between Dart's Imperial, Purple Straw, and Fife Indian. A prolific mid-season wheat with rather short straw. Stools well and withstands drought. Holds grain well. Straw strong and slightly purple in colour. Ears medium size, tip bearded, broad, clubbed at tip. Grain, white, fair size, soft, and inclined to be pinched.

Firbank.—A cross between Zealand and Maffra. A good hay wheat, straw green to the base, with little or no dry flag. Hay of good quality


1908.
MARSHALL'S No 3.
1908.
JUMBUCK


1908.
MEDEAH
1908.
KUBANKA

rather than quantity. Very early to mature. Does not shell grain. Straw good height and slightly purple in colour. Ears tapering at tip, good size, white, grain rather large, white, fairly plump.

Florence.—A mixture of several bloods including White Naples and Fife. Good yielder, but liable to shell. Resists rust and withstands drought well. Ripens early. Straw fairly tall and good quality. Ears medium size, tapering. Very open chaff. Grain medium size, plump, white, and hard. A high quality milling wheat and strongly resistant to smut for which it has been specially bred.

Medeah.—A macaroni wheat. Late maturing. Highly resistant to rust, smut, and drought. Has solid or semi-solid straw. Most suitable for silage. Stock do not like the beards on ear, hence not very suitable for hay. Straw solid and flexible. Ears bluish black, strongly bearded. Grain very large and long; dark yellow in colour and very hard.

Kubanka.—Resembles the Medeah very closely in appearance. The beards make stripping difficult, but otherwise a useful variety for green feed or silage.

In subsequent reports the characteristics of a large number of other varieties will be dealt with.

SUMMARY.

In looking back to the results of the first season, the Wheat Improvement Committee has cause for satisfaction in the general success attending the work. It will require at least four or five seasons before any new crossbred varieties can be placed on the market. The variety and rigidity of the tests to which all hybrids have to submit, before being deemed worthy to find a place under field conditions, must necessarily limit the number of successful crossbreds. Unless a crossbred is manifestly superior in one or other characteristic to any variety now being generally grown, it would serve no useful purpose to advocate its extended growth.

The Committee is keenly sensible of the importance of the work under its charge, and for that very reason will exercise the most rigorous care that none but proved types shall carry their imprimatur.

It is proposed to inspect as large a number of farmers' wheat crops as possible during the coming season, for the purpose of accumulating leading facts in regard to the behaviour of varieties under changing conditions. It is probable, also, that advantage will be taken of the opportunity to make selections from crops grown under field conditions with the view of improving the type by natural selection. Lectures on the objectives and results of the work should do much to arouse the interest of the wheat grower towards a more complete knowledge of true commercial value of his product.

Farmers living in the neighbourhood of any of the experimental stations are cordially invited to inspect the work at any time during the season.

EXPERIMENTS RELATING TO RUST AND SMUT RESISTANCE.

D. McAlpine, Vegetable Pathologist.

As a member of the Wheat Improvement Committee I have carried out experiments relating to rust- and smut-resistance. Similar experiments have been previously conducted, but they now form part of a general scheme having for its object the selection of wheat, which in addition to good-yielding and milling, stooling, early maturing, and strong-growing qualities, will possess the additional properties of resistance to rust and smut. The work of improvement along these definite lines will involve systematic effort, and can only be accomplished by constant and continuous experiment.

Another important phase of the work is the testing of varieties from the point of view of disease, so that in crossing, parents may be selected which possess the qualities desired. Further, the ultimate goal is to breed rust-resisting and smut-proof wheats, so that the enormous losses due to these diseases in certain seasons may be avoided.

For the proper carrying out of the work, one-eighth of an acre has been enclosed with bird-proof netting at Burnley Horticultural Gardens, where smaller plots are established for special purposes. Thus the tests for germination will not be interfered with by birds rooting up the grain, and in other tests the ears will not be destroyed before arriving at maturity. For the larger plots the Agricultural Colleges of Dookie and Longerenong are chiefly utilized, and the experiments are conducted in conjunction with the respective Principals and Assistants.

The experiments during the first year have been necessarily of a preliminary character and include—

1. Testing varieties for rust-resistance.
2. Testing varieties for their liability or non-susceptibility to stinking smut.
3. Experiments with flag smut.

I.—Testing for Rust-resistance.

A brief summary will here be given of the work initiated at Burnley, Dookie, and Longerenong, respectively.

Burnley.—The land chosen is a loose sandy loam, and as this was the first season of the experiment, manure was supplied at the rate of per acre, 1 cwt. superphosphate, ½ cwt. sulphate of ammonia, and ½ cwt. sulphate of potash. There were 63 plots of wheat for testing rust, comprising 10 varieties or selections from Perkins, South Australia; 13 from Sutton, New South Wales, one of which (Nutcut) never germinated; 20 from Pye, Dookie; 4 from Sinclair, Longerenong; 8 from Marshall, South Australia; 1 from Potts, Hawkesbury; 1 from Appel, Germany; 2 from Vilmorin, France; 2 from Department of Agriculture, U.S.A.; 1 from Webb, Bendigo; and 1 from Cumming, Nyah. In comparing different varieties of wheat as to their rust-resistance or rust-liability, it is desirable to have some standard of comparison whereby the relative degrees of rust may be clearly shown. A scale of 10 points is adopted, as being the most convenient, and corresponding to each is a short descriptive term.

Scale of Rustiness.

Free to practically free (F. to P.F.) ...	... 0 to a few specks.
Very slight to slight (V.S. to S.) ...	... 1-2.
Very moderate to moderate (V.M. to M.) ...	... 3-4.
Medium	... 5-6.
Moderately bad to bad (M.B. to B.) ...	... 7-8.
Very bad to rotten with rust (V.B. to R.) ...	... 9-10.

In connexion with rust, it is not only necessary to determine the amount but also the kind of rust, for there is one species. *Puccinia triticina*, which is comparatively harmless because it does not pinch and shrivel the grain, and *P. graminis*, which is very destructive. The latter is the only one requiring to be specially guarded against.

It was not a particularly rusty season, yet several of the varieties were badly affected with *P. graminis*. Bobs and Queen's Jubilee were both bad, while Jade, Fan, Jumbuck, Fife Essex, and Dart's Imperial, were moderately bad, and Federation was moderately rusty. Red Egypt from Vilmorin was the only variety without rust of any kind, and Thew and Upper Cut were both practically free. These and others will be further tested during the forthcoming season.

II.—Testing for Smut-resistance.

It is well known that different varieties vary considerably in their susceptibility to stinking smut or bunt. Thus Allora Spring, which is most susceptible, has yielded 95½ per cent. of bunty plants when the seed was coated with spores, while under the same conditions Minnesota Blue Stem, a strong flour variety, was the least susceptible of ten varieties tested, only producing 12 per cent. But while a small proportion of rust is admissible without seriously interfering with the yield or the quality of the grain, a very small percentage of stinking smut is objectionable and it is necessary, if treatment of the seed is to be dispensed with, to have a variety or strain which is absolutely free.

Experiments in the direction of producing a bunt-resisting wheat have been mainly carried out by the late Mr. Farrer and Mr. Pye, and they are now being continued at the Cowra Experiment Farm, N. S. Wales, by Mr. Sutton. Farrer hit upon the idea of selecting clean plants from the strains of his crosses which showed the smallest percentage of bunt, in order to see if bunt resistance could be increased by a course of systematic selection. He observed that the plants of the variable generation of a cross differed widely in their liability to bunt just as has been observed in the case of rust; and he came to the conclusion that, if the plants of this generation were exposed to infection, by inoculating the seed from which they were grown, then a large proportion of the plants which might otherwise have produced bunt-liable varieties, would be culled out and a higher average of bunt-resistance would be secured in those retained. And if the next generation was similarly infected, further culling out would be made and a still higher average of bunt-resistance secured in the remaining plants. The untimely death of Mr. Farrer in 1906, prevented these experiments being carried to a final issue during his lifetime, but they were continued by his successor, Mr. Sutton, who succeeded in producing varieties which apparently resist bunt; for he writes as follows in the *Agricultural Gazette* of N. S. Wales, for March, 1908:—

> Florence and Genoa have in our trial plots shown themselves under severe trial to be practically smut-proof, and in consequence seed of them does not require to be bluestoned or treated with any other fungicide for the prevention of smut.

If this freedom from smut could have been substantiated on further trial, it would have been a distinct gain to the farmer, if the varieties were otherwise suitable, although it must be remembered that stinking smut of wheat can be so easily and certainly prevented by treatment of the seed, that there is not the same importance attaching to a smut-proof as to a rust-proof wheat.

This question of immunity to smut is a very important one, and experiments to test how far this immunity is hereditary or transmissible and if it is

maintained under different conditions of soil and climate, heat and moisture, were carefully planned. Mr. Sutton willingly supplied seed-wheat of Florence and Genoa for the purpose, and a sufficient quantity of grain was mixed with bunt spores to allow of its being sown in such distinct districts of Victoria as Dookie Agricultural College in the North, under the superintendence of the Principal, Mr. Pye; at Longerenong Agricultural College in the West, under the charge of Mr. Pridham; and at Burnley Horticultural Gardens, near Melbourne, in the South, under my own special supervision. The seed was all dusted equally with spores of *Tilletia levis*, Kuehn, derived from a common source, and it is important to note that the experiments were all on an equal footing as far as the amount and vitality of the bunt spores are concerned. A bulk sample of wheat was mixed with the spores as follows:—Bunt balls were taken direct from the wheat plant and then broken up by rolling them in paper. The spores were next well dusted and rubbed over the moistened grains, so that every grain looked as if it had been dressed with soot. The grain was sent out immediately afterwards for sowing. The results of the experiments have been carefully tabulated, and while they show that Florence may have as much as 12 per cent. of stinking smut and Genoa 22 per cent., yet on the whole they are fairly resistant.

Burnley.—The plots were sown on 16th June in a moist seed-bed. In all cases, the ordinary seed was sown as a check and the check-plots were invariably free from bunt. Florence had an average of 5.66 per cent., and Genoa of 4.72 per cent. of stinking smut.

Dookie.—The sowing took place on 17th June, and the seed-bed was a moist one. The average here was low, being 2.42 per cent. for Florence, and 2 per cent. for Genoa.

Longerenong.—The seed was sown on 1st June in a moist seed-bed. There were only two plots of each sown, a large and a small one, together with the check-plots. The general average was much higher here than in the other two localities, being 9.20 per cent. for Florence, and 14.60 per cent. for Genoa.

The above are the results obtained by treating a bulk sample of wheat with spores from the same species of smut (*T. levis*) which is the one usually met with in Victoria. The average varied from 2 per cent. to 14 per cent., and it is very noticeable the high average obtained at Longerenong.

Since the weather conditions exercise an important influence on the germination of the spores, it may be noted generally for the first quarter of the year 1908, that the rainfall was scarcely 50 per cent. of the average amount, and this was followed by one of the driest April months ever known. The breaking up of the drought occurred in May, and the rains in June were above the average, so that altogether the conditions were favorable for the germination of the spores and the seed-wheat at the same time. It is not always easy to account for differences in the amount of infection, but if we take into account the rainfall for May, the month preceding the sowing of the infected wheat, it may throw some light on it. At Burnley it was .87 inches, at Dookie 1.99 inches, and at Longerenong 3.22 inches, while the mean temperature was very much the same in all. The heavy rainfall at Longerenong immediately preceding the sowing of the wheat on 1st June, would have a tendency to cause a general germination of the spores, and the wheat being in the best possible condition for infection, there was likely to be the maximum of infection.

At Burnley *T. tritici* was also used for infection, but no conclusions as to their relative virulence could be drawn from a single season's experiments. In the two plots of Florence and Genoa respectively inoculated with spores of *T. tritici* the average was 4.16 and 15.68 per cent.

At Dookie, the Principal tested the effect of re-smutting some of the grain already sent with similar spores. 100 smut-balls were powdered and then made into a soft paste with the addition of water; 100 grains were placed in this paste, thus allowing one smut ball on an average for each grain, mixed thoroughly and allowed to soak over night. By next morning the moisture had disappeared and the seed was sown the same day. Infection in the re-smutted grains was the most virulent, for while it yielded 5.72 and 9.79 per cent. of bunt respectively in Florence and Genoa, there was only 2.42 and 2 per cent. respectively with the ordinary dusting of the grain.

It is clear from these experiments that Florence and Genoa do not possess the hereditary quality of bunt-resistance, and Sutton evidently suspected this as he wrote to me as follows in May, 1908:—

> I have been referring to the results of our tests with these wheats while they were being fixed, and I find that in 1905 they were at Lambrigg fairly bunty, and this may indicate that they are not constitutionally resistant to bunt, but they escape bunt through some peculiar characteristic of their growth immediately after germination.

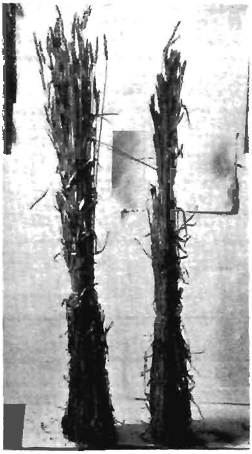
Rapidity of germination is found to be associated with resistance to bunt, and these two varieties are found to be relatively rapid in their germination. But in order to secure complete immunity and the hereditary quality of resistance, it will be necessary to breed from a variety which has shown itself to be free, when exposed to the most severe infection for a series of seasons.

Dookie Experiments.—Mr. Pye, Principal of Dookie Agricultural College, had been working for a number of years in conjunction with Mr. Farrer in endeavouring to produce bunt-resisting wheats by selection after seed-infection. He is still continuing this work and the most promising line lies in breeding from crosses of the Durum variety that resist the bunt. He found for instance that Medeah is not so liable to bunt as many others, and he is using this variety as a parent. The seed of the progeny is then dusted with bunt spores, and the seed from those plants which escape infection is sown next season and so on until a strain is secured which will be bunt-resisting. Among the numerous varieties grown there were several which promised to be more or less bunt-resisting, and these were used as parents for further crosses, but the only one found to be absolutely free during the past season, after thorough infection of the seed, was Medeah. There were also several crosses free such as $\frac{\text{Bobs x Medeah}}{\text{Tripola}}$ and $\frac{\text{Bobs}}{\text{Medeah}}$ and these will be tested in a similar fashion to Florence and Genoa. The smut experiments carried out at Dookie were on a most comprehensive scale, as during the past season there were over 200 plots devoted to smuts alone. In addition to those already enumerated, they included seed treatment with a great variety of substances and the effect of planting smut-balls close to seed.

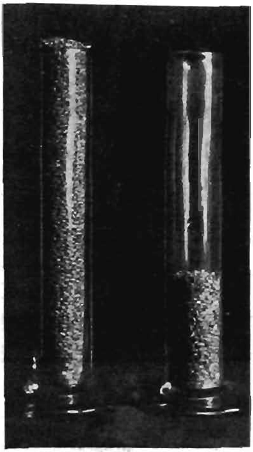
III.—EXPERIMENTS WITH FLAG SMUT.

This is a disease which is widely distributed in the northern areas of Victoria and in some seasons reduces the crop considerably. The spores

of this smut not only infect the young seedling when they are attached to the grain, but more commonly infection occurs by means of the diseased straw or flag in the soil. Hence treatment of the seed is not effective, and field experiments are being carried out to see how far a suitable rotation of crops can mitigate the disease. This Flag smut was first found on wheat in Australia and determined by Wolff in 1873, as being the same as that so abundant on rye elsewhere and named *Urocystis occulta Rab.* An experiment conducted at Burnley showed that this was not so, 200 grains of Federation wheat were inoculated with the spores of flag smut derived from a crop of wheat grown in the north of Victoria the previous season, and 200 grains of rye inoculated with the same smut. Clean seed of both was sown alongside, the date being 28th June, 1908. The



CLEAN AND FLAG-SMUTTED WHEAT.



GRAIN FROM HEALTHY AND DISEASED PLANTS.

object of this test was simply to see if wheat and rye could be infected by the same smut. The results were taken on 29th December, and while the wheat was diseased the rye was absolutely clean. There were 190 plants of wheat altogether, 21 of which were affected with flag smut and 169 clean, so that 11 per cent. were diseased.

The diseased plants bore 85 ears and on counting the ears of 21 healthy plants of the same variety growing alongside, there were 165 or nearly double the number.

The photograph of the two bundles of wheat, each representing the produce of 21 plants, shows the difference of yield of the healthy and diseased. *A* represents the growth of the healthy plants and *B* of the diseased, and the proportion of ears in *A* is nearly double that of *B*,

indicating that the number of ears on each plant affected with the flag smut fungus would be reduced, on an average, about one-half. But when we come to consider the grain produced in each case, then it is found that the yield from the healthy plants is fully three times that of the diseased plants, as shown in *C* and *D*.

Other experiments in pots and in plots proved that the smut of rye and of wheat are not mutually infective, so that the name given to flag smut of wheat by Koernicke in 1877, who received specimens from R. Schomburgk in South Australia should be retained, viz., *Urocystis tritici*.

During the forthcoming season there will be special experiments carried out at Burnley, Dookie, and Longerenong in connexion with the treatment of the seed for smut with various substances, in order to arrive at the cheapest, most effective, and most easily applied. In each case the percentage of germination will be observed. Smut-resistant varieties will also receive attention. The rust-free varieties will again be tested and *Triticum monococcum* will be tried, as it is said to be exceptionally immune to rust.

It is always well to have high ideals, even although they may seem distant of realization, and who knows but a serviceable wheat may yet be evolved resistant to both rust and smut?

ALEXANDRA FODDER CROP COMPETITION.

A. V. Becher, Dairy Supervisor.

Report to the Secretary, Alexandra Agricultural Society

The crops (maize) were, on the whole, considering they were sown broadcast, exceptionally good, and speak volumes for the quality of the soil on the Goulburn flats. They might have been even better, had they been sown at the rate of about ¾-bushel per acre, instead of, as in three or four instances, 2 bushels.

Nearly all the competitors failed in the varieties they chose for sowing, the majority sowing Flat Red and Ninety Day—the two worst varieties on the market for fodder. The difference in colour, growth, and strength of plant was most marked in those plots containing White Horse Tooth and in one good plot of Hickory King.

The general dirtiness of the land impressed me more than anything, many varieties of weeds being strongly in evidence on all the headlands and around the edges of the crops; docks, fat hen, thistles, wild mustard, Bathurst burr, and several other prolific seeders were seen all over the flats. The majority of the plots could be considerably improved by removing the stumps, instead of ploughing around them and leaving them to harbor the weeds enumerated, and letting them seed in the centre of the cultivation.

Some of the competitors lost points by allowing stock to wander through their plots; and in one instance several calves were to be seen roaming through the maize during the inspection, which shows bad fences or careless management. It is a short-sighted policy to grow a good fodder crop, and then, for the sake of a few hours' work in straining up the wires or repairing the fence, perhaps waste a ton or two of good fodder.

The winning crop was an exceptionally fine one, being evenly and lightly sown (¾-bushel per acre), and even in growth. The land was

well-worked and free from weeds. All the plots would have been the better for a little more harrowing and rolling. The best blocks in my opinion required rolling again and another stroke of the harrows.

Selected plants measured in various plots gave heights of 12 ft., 11 ft. 6 in., 11 ft., 10 ft. 6 in., which, for broadcast maize and bad varieties, demonstrates what the land is capable of growing under the best conditions.

From what I saw of the country around Thornton, I think maize could be very profitably grown for grain, and I should like to see a few acres tried next season as an experiment.

In conclusion, I should advise all the competitors to sow their maize much thinner next season, or, better still, in rows three feet apart, and work it between the rows with the horse-hoe at fortnightly intervals until the growth interferes with the passage of the horse. I would also advise trying the following varieties:—Early Leaming, Sibley, Funk's Yellow Dent (of the yellow varieties), and White Horse Tooth and Hickory King (of the white or later varieties). With a little more care in sowing, cleaning up the paddocks from weeds, &c., and working the ground a bit more, the competition next season will be a very difficult one to judge, as the land is practically all about the same quality.

Name.	Methods of Cultivation: Care of Crop and Condition of Soil.	Number and suitability of Varieties Sown.	Succession of Crops.	Freedom from Weeds and Cleanliness of Headlands.	Quantity Sown per Acre and evenness of Sowing.	Apparent Yield per Acre.	Total Gained.	Order.
	20	10	10	20	20	20	100	
H. Hill ..	17	6	2	15	18	20	78	1
T. A. Robb	16	8	8	8	13	16	71	2
W. McMarten	17	2	10	10	14	17	70	3
J. T. Tossol	17	6	8	8	13	13	64	4
Christie Bros.	16	2	6	9	14	14	61	5
J. O'Rourke	17	2	10	7	12	11	59	6

KORUMBURRA FARM COMPETITION.

A. V. Becher, Dairy Supervisor.

REPORT TO THE SECRETARY KORUMBURRA AGRICULTURAL SOCIETY.

The three farms visited were considerably below the standard of what are termed "Prize Farms"; and considering a competition was held last year, there has not been as much improvement shown as one would have expected.

Mr. Glasgow has certainly considerably improved his water supply, having made a reservoir at the head of one of the gullies, and laid the water on by gravitation to a trough with a ball tap; but this is only in one paddock, and I should like to see it in every paddock next year instead of the small soakage holes, which are easily puddled up, and do not give a nice clean drink, which is most essential for milking cows, as also is the necessity that they should have their udders and feet kept free from contamination by paddling in stagnant water holes.

No attempt has yet been made on any of the farms to weigh and test the milk, and they all failed to score a point in this division which is one of the most important points in connexion with dairy farm management; for how is the farmer to tell whether a cow pays him or not unless he keeps some record of her test and daily yield?

Mr. Glasgow deserves great credit for the splendid condition of all his farm stock, especially when it is considered that this is a very dry summer indeed for South Gippsland. His two-year-old heifers were really fine, and when one realizes that they were all reared on whey—which is not generally considered very good stuff for successful calf rearing—it speaks well for his method of feeding calves.

One thing that impressed me more than anything else was the lack of any attempt to conserve the farm yard manure. On all the farms the absence of a compost heap was marked, and the manure was allowed to lie about for the fowls to scatter and to be blown about by all the dry summer winds. Since the advent of artificial manures, farmers have come to look on their stable and cow-yard manure almost as a nuisance instead of one of their best assets, and it is a great pity they do not take more trouble to properly conserve it.

Considering the smallest farm visited consisted of 320 acres, the small amount of cultivation done seemed remarkable, ranging from 17 acres on the winning farm to 40 acres on Mr. Williams' farm (about 640 acres).

Mr. Williams and Mr. Olsen lost points by not being able to show any two-year-old or yearling heifers, which is, to my mind, an important item, as they are very necessary to replace the older cows in the herd when they are culled for age or other faults.

Mr. Williams had some very nice maize sown in drills; also a fine crop of potatoes, and a good crop of broad beans grown for his pigs. He had the timber on the farm ready for building a silo. His stock were not in nearly such good order as the other two farms, and I think he would have been wiser to have begun feeding his maize earlier in order to avoid his cows losing too much condition before the winter sets in.

Mr. Olsen also had some good fodder crops (maize, pumpkins, mangels, and potatoes). His cows were in splendid condition, and seemed to be well cared for.

The garden at Mr. Glasgow's was exceptionally neat, and the roses made a very fine show indeed. I was also pleased to see a tennis-court on this farm, which shows that the members of the family manage to have some time for recreation and pleasure.

There was some room for improvement on all the farms in manure conservation, recording yields and testing, cleanliness, and sanitation of pigstyes, larger areas and more variety of cultivation.

Name.	Financial results per cow per annum.	Cleanliness, construction, and arrangement of yards, buildings, &c.	General management.	Methods of recording milk yields and test.	Quality and type of herd, bull and breeding methods.	Total.
	20	20	20	20	20	100
I. W. Glasgow ... (Bena)	16	14	16	Nil	17	63
W. J. Williams ... (Kongwak)	11	15	15	Nil	13	54
P. A. Olsen ... (Mayfield *viâ* Poowong)	13	9	10	Nil	15	47

CATALUÑA.

F. de Castella, Government Viticulturist.

The north-east corner of Spain has for several centuries been known as Cataluña. This roughly triangular area is bounded on the north by the Pyrenees and France. It lies to the east of the once Kingdom of Aragon, from which it is divided by an uneven line running in a more or less northerly direction from Vinaroz and Ulldecona, near the mouth of the Ebro. Its south-eastern boundary is the Mediterranean.

This region embraces the three coastal provinces of Barcelona, Tarragona and Gerona and the inland one of Lerida—8,000,000 acres of land, varying enormously as to its soil and climate, for it extends from the mild Levante, with its palms and orange groves, to the everlasting snows of the Pyrenees, the highest point of which, the Pic De Aneto (11,063 feet), is situated near the point where the Aragonese boundary strikes the frontier of France. In many ways Cataluña differs radically from the rest of Spain. A new arrival from Madrid or Pamplona is at once struck by the difference in its inhabitants, for the Catalan belongs to a different race to the Castellano or true Spaniard. Though he may admit that he does not possess the grace of manner of the latter, he will tell you that his greater energy and business activity more than makes up for it, and he looks upon himself as a superior, and especially a more go ahead individual than his neighbours from the south and west. The Catalan is the business man of Spain, and Barcelona, the capital of the region, is the foremost manufacturing and business town in the Kingdom. Its population now numbers half-a-million. There is in fact a certain amount of jealousy between it and Madrid which has of late years caused a good deal of political unrest. Cataluña has for some time been agitating for "Home Rule" on similar lines to that enjoyed by Navarra. Complaints are sometimes heard about taxes levied on the energy and business ability of the Catalan being spent to beautify the metropolis, &c. Political questions were, of course, foreign to my programme, but it is not possible to write concerning Cataluña without briefly referring to the unrest one occasionally hears about, especially outside of Spain. The trouble is not by any means of recent origin. It has existed since early times when each of the principal regions of Spain was a distinct kingdom.

Racial differences have prevented the absorption of Cataluña being as complete as that of other portions of Spain. *Catalan*, the language chiefly spoken, is an ancient one, quite distinct from Spanish and nearly identical with the French patois known as *Languedoc*, which is still spoken in the adjoining Department of Roussillon, just across the border, which was at one time united to Cataluña, the two forming a country the ownership of which changed occasionally. Its history is most interesting and a brief summary may be permitted.

Inhabited originally by the Ceretani, Indigetes and Ausetani, these tribes were conquered by the Romans who named the province Tarraconensis. In the fifth century Barcelona * became the head-quarters of the kingdom of the Visigoths, from whom it was captured by the Moors. Retaken later by Charlemagne, it was divided into independent "seigneuries," of which the county of Barcelona was the most important.

*Originally founded by Hanibal Barca the Carthaginian in 230 B.C.

it eventually absorbed the others. This county varied greatly in size. In Charlemagne's time its boundaries were much as they are at present, but sometimes it embraced the Roussillon, at one period extending even as far as Montpellier. In 1137 Raimond-Bérenger, Count of Barcelona, a French subject, became King of Aragon and it was about this time that the name of Cataluña came into general use. It is said to be a corruption of Gothalania, a reference, no doubt, to the early Gothic occupation. Raimond's son, Alfonso II., succeeded in freeing himself from France in 1182 and henceforth Cataluña formed part of the Kingdom of Aragon; not without occasional revolts though, for on several occasions it succeeded, for a time, in throwing off the Spanish yoke. Revolting against Philip IV. in 1641, it became French once more for a period of eighteen years after which it reverted to Spain. On several other occasions it was for a short time French, the longest being from 1694 to 1697.

Such is a brief historical sketch of these descendents of the Visigoths who even at the present day constitute a distinct race, remarkable for its industry, energy and business capacity. Personally, I found the *Catalans* I met to be charming people, perhaps a little more brusque in manner than the true Spaniard; in many ways very similar to their southern French neighbours from across the Pyrenees.

Agriculture in Cataluña.

Agriculture generally, and viticulture in particular, have attained a high stage of perfection in the region. Wherever water is available, irrigation is practised and we find Huertas reminding one of that of Valencia, though on a smaller scale, for the extent of irrigable land is not nearly so considerable as in the Levante. In these Huertas one finds the same intense culture and diversity of crops that has already been described. The Huerta del Llobregat, quite near Barcelona, is one of these. Here the land is worth several hundred pounds per acre and is leased up to £10 per acre exclusive of house rent.

Where underground water is available, at a small depth, it is invariably utilized, the raising of it being effected by Norias of similar construction to those used by the Moors several centuries ago. A photograph of one of these at Villafranca del Panadés is here reproduced. This shows the horse (or rather mule) works, wooden cog wheels, and lift with earthenware buckets tied to an endless rope.

It is, however, cultures of the *Secano* or unirrigable type which are of most importance, chiefly vines, olives, cereals and several other less usual crops, some of which may be briefly described.

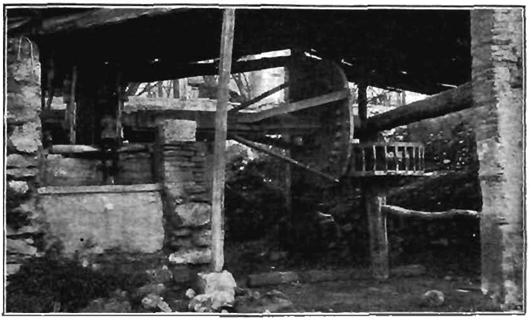
The Cork Oak occupies a very considerable area, mostly of poor land unsuitable for other crops. Cataluña is one of the principal cork districts of Spain and at present prices the results of this form of forestry (it can scarcely be classed as agriculture) are very profitable. It is astonishing that we have so persistently neglected this tree, which will thrive so well in Victoria and which demands no labour except at the time of harvesting the cork crop. The value of acorns as pig food should not be lost sight of.

The Avellano or Barcelona Nut (*Corylus avellana*). Large orchards planted exclusively with this small tree are to be seen on the train journey from Zaragoza to Barcelona, after passing the Ebro at

Mora la Nueva, when one enters the Priorato district. Argentera is the chief centre of this culture. In appearance the tree is very like the ordinary filbert; the special Barcelona variety seems to thrive in much drier situations. Several different sub-varieties are cultivated, the most highly esteemed of which is that known as *Negretta* which is said to be very prolific and to require little moisture in the soil. Some plants of this variety have been introduced by the Department of Agriculture and are now growing at the Burnley School of Horticulture.

The production of Barcelona nuts was highly profitable last season: the demand was brisk and at the time of my visit all stocks had been cleared at satisfactory prices; 40 sacks of 58 kilos each are obtained from an hectare, equivalent in English measures to 2,041 lbs. per acre.

ALGARROBOS (Carob trees) are a familiar feature in southern Cataluña, though north of Barcelona the climate seems to be too cold for them. South of Tarragona, large areas of dry stony land are rendered profitable by the cultivation of this tree.



NORIA (MOORISH WATER LIFT) AT VILLAFRANCA.

The GARBANZA or CHICK PEA (*Cicer arietinum*) is a typically Spanish product which is grown in Cataluña though less extensively than in some other parts of Spain. It was here, however, that I was able to learn something about its culture. The Garbanza is a very important article of human food in Spain. It is sold in the dry state and soaked in water for a few hours before cooking. Garbanzas enter largely into the composition of the *Cocido*—a form of stew which is the basis of the food of the people. For this purpose they are as necessary to a Spaniard as potatoes are to an Irishman.

At the Government experimental farm near Barcelona, I was able to obtain some information as to the culture of this plant, which may prove a valuable introduction to Victoria. It is sown about the first week in January, in this part of Spain, in drills 1 foot apart, at intervals of 10 inches. The Garbanza is a peculiar crop, only doing well in certain localities; in many places it fails owing to a fungus disease

known locally as *Rabia.* In districts suited to it, large yields are obtained and it is a most profitable crop. Sauco, in old Castille, is celebrated for its Garbanzas which are considered the best in Spain, for there is much variation in quality. Some, on soaking and cooking, become far more tender and palatable than others. The best Garbanzas are sown on land free from excess of lime.

* * * * *

The principal forms of agriculture are cereals, vines and olives: of the former, the acreage of wheat, barley and oats sown, and the quantities harvested, in the whole of Cataluña, were as follows in 1906:—

	Wheat.	Barley.	Oats.
Acres sown ...	484,300 ...	189,300 ...	34 025
Bushels harvested ...	6,647,520 ...	3,094,124 ...	727,133

The importance of vine and olive culture is shown in the following table taken from the official statistics for 1906:—

Province		Vines.				Olives.		
		Acres.		Gallons.		Acres.		Gallons.
Barcelona	...	287,770	...	28,261,310	...	13,500	...	100,496
Tarragona	...	218,742	...	29,713,354	...	147,280	...	895,180
Lerida	...	45,125	...	6,265,688	...	178,762	...	3,050,564
Gerona	...	24,930	...	2,368,982	...	37,825	...	374,154
		576,567	...	66,609,334	...	377,367	...	4,420,394

In other words, over a million and a half acres are under cereals, vines and olives; the area under vines exceeding half-a-million acres.

AGRICULTURAL EDUCATION AND EXPERIMENTAL WORK.

Though experimental agricultural work has long been conducted, the encouragement it has received has often been of a rather spasmodic kind, owing to political and financial troubles. Of late years a marked forward movement is noticeable. The present Government appears to be convinced of the value of such work and its beneficial influence in promoting general prosperity. The older *Granjas* or experimental farms have been extended and equipped so as to enable them to act as educational centres as well. Several Government institutions in Cataluña combine both classes of work: such are the Escuela Practica de Agricultura at Barcelona and the Experimental Station at Figueras in the northern province of Gerona, devoted to general agriculture, and the Estacion Enologica at Villafranca del Panadés and the more recently established one at Reus, which are exclusively viticultural. The Barcelona school is situated in one of the suburbs of the town; it is run on somewhat similar lines to the Valencia school at Burjasot and appears to be doing very good work under the management of Don Juan Salvador Borrás. Amongst other experiments under way, were some in connexion with wheat, both as regards manuring and new varieties. Several crops new to the district are also being tried; one which the Department is anxious to popularize is cotton. The experiments conducted so far, have not been very successful, owing to maturity being rather late in the latitude of Barcelona.

A curious feature at this school, especially to an Australian, was the *Conejar* or warren, where students are taught the commercial raising of rabbits; such a sight was calculated to raise hopes of our finding an outlet for some of our frozen rabbits in Spain. The other Government institutions will be referred to in connexion with the districts in which they are situated.

POINTS OF VITICULTURAL INTEREST.

Before leaving Australia I had been told that I should find less to interest me, so far as the work of my mission was concerned, near Barcelona, than in Andalucia, La Rioja, &c. I was therefore somewhat surprised, on obtaining official statistics in Madrid, to find how vast was the importance of viticulture in Cataluña, which produces more wine than any other region in Spain. My visit was a revelation to me. Nowhere else in Spain did I see wine handled in such enormous quantities. I had seen wineries which dealt with very large quantities, in La Mancha, The Levante and La Rioja, but these could not compare with the Bodegas of the leading wine merchants in Barcelona and Reus. The size of the storage vessels and the power and capacity of the wine pumps were truly astounding. I was brought face to face with a trade in wine on a scale of which I certainly had no idea, nor do I think its importance is usually realized outside of the country. One feels inclined to ask, What happens to these rivers of wine? A good deal of it is no doubt consumed in Spain, in which country, as in its Latin neighbours, wine is looked upon as a necessary of life. A large quantity is shipped to England under the name of Tarragona Port, and the balance, a very large proportion, finds its way to South America. The importance of the latter trade must still be very great, though it is rather less than it was some 20 years back, owing to the increase of the wine production of these countries. Their populations are mainly of Spanish descent and, although long since separated from their mother country, they still look to her for what is fashionable in the way of eatables and drinkables. Being descendants of wine drinking people, they take more kindly to wine than our beer and whisky drinking people so that, in spite of their own locally grown wine, there is room for considerable importation from Spain and most of this comes from Cataluña.

I regret that I was not able to secure statistics as to the quantities shipped. Though I was treated with the utmost courtesy and shown far more than was really to be expected, under the circumstances, I could note a certain amount of reticence concerning trade with South America which compelled me to limit the questions I should like to have asked.

I was shown samples of a good many of the wines shipped. Although belonging to several different types, they all had for foundation the wine known in old days under the name of *Priorato*—after a small district some miles south-west of Barcelona and near Tarragona. The modern Priorato type is different from the ancient which was essentially what was known as a *Rancio* wine, a term which will be explained presently. The modern or table Priorato—Priorato de Mesa, as it is termed in Spanish, the name under which it is largely shipped—is intermediate between the older type and the "vin ordinaire" of Spain—a light coloured red wine of fairly high alcoholic strength, either dry or slightly fruity. This wine will be more fully described later.

From a geological point of view, Cataluña is most interesting, especially to an Australian, for Primary formations, similar to our own, are much more frequently to be met with here than in other parts of Spain. Especially in the Pyrenees, are rocks of this age plentiful, even in the lower ramifications of the ranges they are frequently to be seen. Don Nicola de Los Salmones at Pamplona had already drawn my attention to this fact (see *Journal*, November, 1908, p. 690), and advised me to visit the province of Gerona, the northern part of which is largely of Primary geological age. I therefore looked forward eagerly to my investigations in these

parts, hoping in the flanks of the Pyrenees, to find soils similar to those which will probably prove our most difficult ones in Victoria—the stiff limeless clays containing silica in a fine state of division, which set hard after rain and dry without cracking. My quest after such soils was only partially successful. Primary formations I certainly did find in abundance, but the soils were usually fairly friable, and less "difficult" than I had anticipated; rather the soils of the stony hillsides of Rutherglen than the stiff silty clays of the Goulburn Valley.

The question of geological formation has a most important bearing on the character of the wine produced, for it is only on Primary soils that wines of the old Priorato type with a strong Rancio character are regularly produced.

Cataluña from a geological point of view presents much variety. In addition to the Primary soils free from lime above referred to, there are large areas of Secondary age, usually fairly calcareous, as well as Tertiary formations, often rich in lime and "difficult" so far as reconstitution is concerned on this account, though their physical state is usually satisfactory. Alluvial soils also abound, but these are only exceptionally devoted to viticulture.

* * * * *

I arrived at Barcelona, from Zaragoza, on 6th January, 1908, leaving on the 10th January for Valencia, Gandia, and Denia, my investigations in which centres have already been described. I returned to Barcelona on 23rd, in which city and its neighbourhood I spent nearly a week before finally leaving Spain for France, *viâ* Figueras and Llansa.

On my arrival in Barcelona, I presented a letter of introduction from our Agent-General to Don José Gras y Fort, for many years a resident of Melbourne, but who, some little time ago, returned to his native land. I cannot thank Don José enough for his kindness and the valuable assistance he gave me. He retains the warmest friendship for Australia and took a great interest in my mission. I have to thank him for introductions to some of the leading wine merchants of Barcelona and of Reus, his native town, the commercial centre of the ancient Priorato, and now of the Tarragona Port trade.

Reconstitution.

The provinces of Barcelona and Tarragona were officially declared to be phylloxerated in 1888. The pest spread rapidly in Cataluña, which was thus one of the regions which had to face reconstitution at an early period. It suffered in consequence from the same disabilities in connexion with it as Jerez, Malaga, and other early infested districts.

Twenty years ago, the era of active Government assistance had not commenced. Growers were left to their own resources, and had to work out their own salvation as best they could. The information available was necessarily far less complete than it is at present, for even in France replantations on a large scale were comparatively recent. For that country, it was still the Riparia period, though even at that time the Rupestris was beginning to attract attention. Early replantations in Cataluña were therefore largely on Riparia stocks. The usual failures, for which this variety is responsible, especially in dry situations and limestone soils, were experienced, entailing the rooting up and replanting of many thousands of acres, chiefly with Rupestris du Lot which is at the present day the stock most widely planted. Reconstitution has long since been practically completed, and on the whole with good results, though even now some of the early planted vineyards are being replaced by vines on more satisfactory

stocks. The extent of replantation is shown by the comparison of viticultural statistics for 1889, when phylloxera was just making its ravages felt, with those for 1906.

Province.	Acreage under Vines in— 1889.*	1906.
Barcelona	330,387	287,770
Tarragona	276,670	218,742
Lerida	249,217	45,125
Gerona .. .	12,962	24,930
	869,236	576,567

With the exception of a considerable shortage in the province of Lerida, the majority of the Catalan vineyards destroyed by phylloxera have been replanted on resistant stocks.

As regards stocks, one of the most striking features of reconstitution in the region is the popularity of Rupestris du Lot. As at Montpellier (France), this stock certainly forms the basis of the majority of the vineyards. It appears to be suited to both the climate and soil, and, as is usual when such is the case, it is very generally preferred; those who have employed it largely being loud in its praises.

Nevertheless, of recent years, more recent stocks, especially hybrids, are proving their qualities and in many cases are being largely used for newer plantations. In a general way, opinions concerning them agree with what I have reported already in connexion with my visits to other districts of Spain. The Franco-American hybrids, in particular, are coming into more and more general use.

Scion varieties vary a good deal, from one locality to another, for specialization is much in evidence. For Rancio wines of the Priorato type, the Garnacho (Grenache) is the dominant variety. In some places it is blended with a little Carignane here called Cariñena. This latter is the principal sort for the production of red "vin ordinaire" for local consumption. Several sorts of local origin are also to be met with, such as Trepat and Sumoll. White wine is also largely produced in the region chiefly from Xarelo, Macabeo, Parellada, Subirat Parents, &c., but the relative importance of the leading stocks and scions will be further dealt with when describing some of the viticultural centres I was able to visit.

THE INSTITUTO AGRICOLA CATALAN DE SAN ISIDRO.

This remarkable agricultural association has had a most potent influence on reconstitution in Cataluña, and has done much to make up for the apathy of the Government in the early days of the struggle. It undertook the dissemination of most recent knowledge, and carried out the work the State is now doing so well in Navarra, Valencia, La Rioja, and elsewhere.

This organization is named after St. Isidor the husbandman, the patron saint of agriculture. It was founded in 1875, some years prior to the outbreak of phylloxera; owing to the increasing amount of work it found itself called upon to undertake, the original plan was considerably extended, modifications in its constitution being several times found necessary. The rules now in force date from 1902. They state the objects of the institute to be:—

To bring about the improvement of agriculture, and to promote and facilitate the development of all branches of this (national) wealth; to closely guard the interests of the agricultural community; to promote kindly relations between those who compose it and to contribute to their instruction, culture, and well-being."

* These figures do not include irrigated vineyards, of which there was a considerable area prior to phylloxera. The tendency, now-a-days, is to only plant vines in non-irrigable land.

The discussion of religious or political questions at any of the meetings is expressly prohibited by the rules.

The institute owns a handsome building in the town of Barcelona containing club rooms, where papers and publications (mainly agricultural) are available for the use of members; a complete agricultural library and museum, containing specimens of all kinds calculated to interest farmers, such as samples of soil, of agricultural produce, and special products, as well as specimens and illustrations of diseases, &c. A well equipped laboratory is included in the building where research work is being carried out by an efficient staff. Lectures are given and meetings held for the discussion of subjects of interest to farmers, and everything possible is done to encourage and aid in the dissemination of the most recent scientific and technical agricultural knowledge. This object is aided by the publication of a review of 16 pages, exclusive of advertisements, issued fortnightly.

Experimental plots and model farms are conducted by the institution, which even undertakes to promote and protect institutions useful to agriculture such as banks of credit and crop insurance societies.

Members are of several classes, the first of which, known as resident members, pay an entrance fee of 20 pesetas (16s.) and an annual subscription of 60 pesetas (48s.) per annum, payable monthly.

Branches have been established in rural centres to assist in the work. The institute is represented in Madrid by a permanent Committee, which communicates, when necessary, with the Central Government.

Very complete rules have been drawn up for the working of the whole organization, which appears to be thoroughly efficient, and to be of the utmost value for the assistance and encouragement of agriculture in the region at a moderate cost to members.

Similar organizations exist in France, but the Instituto Agricola Catalan de San Isidro is, so far as my experience goes, unique of its kind in Spain.

Of recent years, the Central Government has certainly been making up for its earlier inaction and has established experimental farms and schools in several centres, so that those now replanting have everything greatly facilitated. Had it not been for this institution and the good work it performed in the early part of the struggle, the reconstitution of Catalan vineyards could not have reached its present position.

In the laboratory of the Institute, I had an interesting conversation with Don Jaimé Raventos, who has charge of its scientific work. He explained to me that reconstitution in the region could be summed up by saying the stocks used were Rupestris, Rupestris and Rupestris (always du Lot). The usual course was for the grower to try this stock: if it did not succeed, which as a rule only happened in excessively calcareous soils; he was compelled to try all kinds of newer things. Riparias had on the whole proved a failure. They were much planted at first but in a hot summer many died out.

I also visited Don Ignacio Girona y Vilanova, a member of the Spanish Cortés (Parliament) and a large vineyard proprietor, who takes a deep interest in the work of the Institute. It was he who explained to me the great work it had accomplished and how the Catalans had combined to help one another, and by means of experimental plots and co-operation, to collect and disseminate the necessary information. Don Ignacio in the early days planted Riparias mainly—it was then the Riparia period in France. He has regularly filled in misses with Rupestris du Lot. His vineyard was entirely reconstituted, as also most of those in the region, by field grafting, and he expresses himself quite satisfied with the result. He is a believer in summer grafting but, instead of the bud graft practised

in Andalucia (see Jerez and Almeria reports), he has employed the Cadillac or side cleft graft executed in August (February in Australia), the scion remaining dormant until the following spring.

He favours the use of scions with two eyes, rather than the original Cadillac method with one eye only. In his opinion, summer grafting, by dividing the operation into two stages—the first, a preparatory one limited to the formation of callus, which has ample time to mature before the start of growth in the following spring—insures very perfect unions. Don Ignacio says that with the side cleft graft one is less exposed to damage from high winds, in early summer, than with budding, which he has also tried. As regards scions, he has introduced several varieties new to the region, in addition to those usually cultivated, notably the Cabernet Sauvignon of France, which Catalan vignerons know under the name of Perpignan. Long pruning, which is unusual about here, enables him to obtain good yields of light wine from it. Amongst the local red varieties, he has a good opinion of is one known as Exquixagos. For white wine he favours the Pedro Ximenes of Southern Spain which produces a clean delicate wine in good quantity. The Xarelo, a good local grape, is in his opinion very similar, if not identical with, the Palomino of Jerez. This vine was probably introduced to the district as Jerez-lo or Xerez-lo which gradually became Xarel-lo. Thus do local names possibly originate. These have led to the very complex synonyms and the general confusion which exists in the nomenclature of the vines of most countries.

Don Ignacio is strong on the folly of sacrificing quality to quantity, and the need for specializing and limiting one's production to the type of wine the vineyard is qualified to produce in greatest perfection and sufficient quantity.

(To be continued.)

ANSWERS TO CORRESPONDENTS.

WHEAT FOR BACCHUS MARSH DISTRICT.—IVAN asks which variety of wheat would be best for the Bacchus Marsh district. His land is of a sticky, clayey nature—new ground fallowed.

Answer.—Federation is recognised as being the most prolific yielding wheat for grain. It is unsuitable for hay on account of its short straw. Dart's Imperial, Jumbuck, and Bunyip are good hay wheats, and also good yielders of grain. The seed sown with an ordinary grain drill is covered from 1 to 2 inches. Seed of any of the varieties mentioned may be procured from the Department of Agriculture at 5s. 6d. per bushel which does not include railway freight.

GYPSUM.—J. T. H. inquires whether it would be advantageous to use gypsum with superphosphate on heavy clay soils.

Answer.—Gypsum may be added to superphosphate in any quantity without fear of deteriorating the activity of the fertilizer. Upon stiff clay soils gypsum at the rate of 4 to 6 cwt. per acre could be given with advantage. Superphosphate contains a high percentage of gypsum, produced during manufacture.

WHEAT SAMPLES FOR IDENTIFICATION.—R. W. B. forwards several samples of wheat for identification. Except in a very few cases, it is quite impossible to identify wheat varieties from the grain alone. If specific information regarding the period of ripening, colour of straw, length, strength, &c., is forwarded, a determination could be arrived at. Next season, when the varieties are growing, would be the most suitable time for identification.

IRRIGATED FODDER CROPS.—M. D. (NORTHCOTE), requests information relative to the best crops to sow on irrigable land (deep black soil) for early winter fodder for dairy cattle; also inquires *re* best grasses for permanent pastures.

Answer.—Rye is, perhaps, the earliest fodder crop. It could be sown immediately after next rain. In March, barley and peas or oats and peas make quick growth, but if grazed heavily will not survive. Under irrigation, any cereal crop will do well, but care must be taken that cattle do not tread the land too much after watering. It would be more serviceable to cut and hand feed any irrigated crop. The most reliable grasses and clovers for permanent pasture are Perennial

Rye, Alsyke Clover, Prairie Grass, Cow Grass Clover, and *Paspalum dilitatum*. At least a portion of the pasture should be fenced off and devoted to lucerne solely. This should be watered frequently during the summer and will give five to seven cuttings.

Concrete Silos.—R. G. wishes to know whether concrete silos are safe.

Answer.—Concrete silos are perfectly satisfactory if well made. They, however, require reinforcing to insure safety. See article in *Journal* for July, 1907.

Impaction.—S. C. asks whether there is any cure for impaction.

Answer.—Simple impaction is best treated by giving $1\frac{1}{2}$ lbs. Epsom salts in a quart of water and followed three times a day by $\frac{1}{2}$ oz. solution of strychnine in 1 pint of water.

Value of the Escutcheon.—J. S. inquires whether the escutcheon is of any value as a guide when choosing a bull for the dairy herd.

Answer.—Guenon on Milch Cows lays great stress upon the value of the escutcheon of the bull and as a guide when selecting calves. There is no doubt that when properly interpreted, the escutcheon is a good guide. See page 466 of the *Journal* for August, 1908.

Excessive Yawning by Horse.—J. S. asks what is the cause of excessive yawning by a horse.

Answer.—It is frequently a symptom of indigestion and also of too much feed and not enough work.

Swelling on Udder.—Ivan states that one of his recently calved cows has a large lump or swelling on the udder, just above the back teat. The cow appears to be quite healthy, and gives no trouble during milking.

Answer.—Without an examination it is difficult to say what the swelling is due to. It may be merely mild mammitis or a case of tubercle. The Dairy Supervisor in your district may be able to assist you.

Oats for Pigs.—Ivan asks whether oats (seconds) are good feed for pigs.

Answer.—Oats form a valuable adjunct to the ration for pigs, and are especially useful for breeding sows. They are best fed crushed, not cooked.

Destroying Crickets.—J. M. states that his paddock of strong black land, which has been laid down in grasses for two years, is badly infested with crickets. The ground is now very open with cracks, and the crickets are coming up in millions, and doing much damage.

Answer.—The feeding of turkeys (over 6 weeks' old) on the infested land has proved efficacious. The birds clear the place of crickets in no time, will fatten well, and can be marketed at a profit. If foxes are about, the flock should be shepherded and housed at night.

Grafted Resistant Stocks.—H. V. wishes to know where he could obtain a small quantity of table grape vines grafted on resistant stocks.

Answer.—Grafted resistant stocks are only supplied by the Department of Agriculture. Vines are only grafted to order, and applicants must furnish their own scions. The Department provides the stocks. For the 1910 planting season, orders, accompanied with a deposit at the rate of £1 per 1,000, should be submitted before the end of May, 1909.

Wood Ashes.—F. J. E. asks whether ashes from a boiler furnace have a manurial value.

Answer.—If *wood* ashes, they are of a beneficial nature on account of the percentage of potash present, and also of their effect in neutralizing any soil acidity and tending to ameliorate the mechanical condition of the soil.

Plants for Identification.—Specimens have been forwarded by A. G. H. and J. W. H.

Answer.—1. (A. G. H.) Veldt Grass (*Ehrharta longiflora*, Sm.). A native of South Africa now naturalized in this State; a perennial grass of some use as a pasture grass in moist situations, but by no means in the first rank of pasture grasses. When growing in dry situations it dies off when pasturage is most needed and is then almost an annual maintaining itself by seed. This grass was formerly sold under the incorrect name of *Themeda avenacea*, which is a much superior grass. The Veldt Grass is more likely to thrive under Gippsland conditions than in the Western or drier districts for which the true *Anthistiria* (*Themeda*) *avenacea* is better suited.

2. (J. W. H.) *Escallonia montevidensis*, D.C. A native of South America belonging to the *Saxifragaceæ*, and occasionally grown in gardens. It is a good bee plant, can easily be propagated by cuttings, and would make evergreen hedges so long as these were not in an extremely dry or exposed situation. It would, however, be of no use as a hedge plant to keep in stock unless reinforced by barbed wire. The plant has no poisonous or injurious properties and is rather a handsome shrub.

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WHEAT IMPROVEMENT COMMITTEE.*

1.—PROLIFICACY OF WHEAT.

H. Pye, Principal, Dookie Agricultural College.

In the opinion of wheat growers, the one quality that should stand pre-eminent in order that a variety may be popular is that of prolificacy. At the present time, provided the grain is marketable in appearance, the quality or flour-making properties of a variety does not receive the consideration that it should; still, indications point to the fact that more and more importance is being attached to the quality of the grain as a factor in its commercial success.

It does not, however, follow that a cast iron rule should be laid down, since climatic and other environal conditions must be considered. Thus, the vigneron of high altitudes and poor soils cannot generally be expected to make classic Ports and Sherries, any more than can the vignerons of hot districts be expected to hold the market for such light and delicate wines as Chablis and Moselle. The cool and hot districts respectively may produce wines of a high type, but wines are practically peculiar to given climatic conditions. Thus, wines from a hot district are often branded Chablis; but they should not, with rare exceptions, be classed as such, being in reality only substitutes. Vignerons differentiate when selling wine for distillation. They expect a higher price for a wine containing 28 per cent. of proof spirit than for one containing 20 per cent., and the distiller is willing to pay the higher price just as the dairy factory manager pays a higher price for milk containing a high percentage of butter fat than for that containing a low percentage. This is equitable, both to the producer and to the buyer; and the consumer reaps the benefit, as it tends to cheapen his food by encouraging the breeding of cows that will supply more butter fat from the same given amount of food of similar quality. On the other hand, wine not sold for distillation is not sold according to its spirit-content but according to its bouquet, flavour, and other qualities that make it pleasant to the taste.

Now, wine has a limited claim on the masses, as it is usually beyond their means. With bread, however, the case is different; hence the

* [illegible]

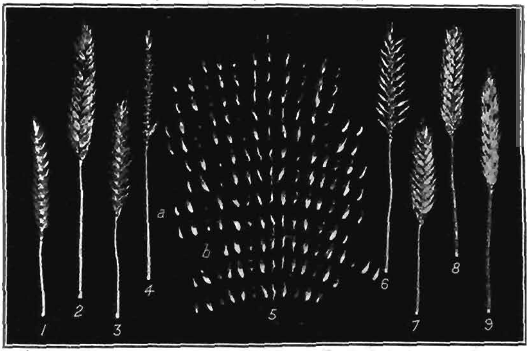
encouragement given by governments to the introduction and development of wheats with muscle-making qualities. To be impressed with the importance of this fact it is only necessary to turn to those countries where meat, the other great muscle-making food, is a luxury and not an every day part of the diet, and where the wheaten bread forms the staple article of diet. The people fed on bread containing 14 per cent. of gluten will attain a higher state of mental and physical development than those fed on bread containing only 12 per cent., unless the latter use, in conjunction with the bread, pulses and such vegetable foods rich in protein. In passing, it seems a pity that Australians as a rule are not aware of the many appetising muscle- and frame-forming vegetable foods that could be grown and used by them. In matters relative to their diet their conservatism is more pronounced than in their politics.

1. ILLUSTRATIONS OF WHEAT EARS AND DISSECTIONS OF SAME.

(1) Dissected ear showing rachis "r" and the rachillæ "rc" arranged alternately on the shoulder joint of either side. (2) Sp., front view of spikelet; Sp. 1, a spikelet opened out showing three fertile florets with a grain in each; Sp. 2, a reverse view of Sp. 1; Sp. 3, a side view of two spikelets; Sp. 4, the end or terminal spikelet. (3) An ear of Bobs wheat illustrating the rows of spikelets. (4) Illustrates the attachment of the spikelets to the rachis. (5) An ear of Bobs wheat with the outer and inner glumes removed, exposing the grain. (6) A side view of the rachis illustrating the zig-zag form and the attachment of a spikelet to it. (7) Front view of a rachis of Bobs wheat with spikelet showing the grain in the fertile florets. (8 and 9) Side and front views of rachis of Durum wheat illustrating the heavy basal and lateral rachis hairs. (10) Large grains of a bald Polish crossbred arranged in order to illustrate the side view, the front or bosom, the crease and crease folds, also the brush ends, the germ ends, cross sections and longitudinal sections. The top two illustrate another view of the crease and a side view of a grain. (11) Grains of a well-developed Purple Straw ear. (12) (lowest) Sketch of germinated grain: b, the brush; ra, radicle or root; 1, first leaf, plumule; g, germ end; Sketch of cross section of a grain of wheat; br, bosom or breast; cf, crease folds; c, crease; a, a, a, three anthers with filaments attached enclosing the pollen or fertilizing grains (male); Ov, ovule or immature wheat grain; st, the two feathery stigmas (female) which, when the anthers or pollen cases ripen and burst, become dusted with pollen grains and so fertilization is effected; b, brush hairs.

Certain varieties of wheat under some conditions produce grain that makes a perfect flour; but, unfortunately, it happens that the same varieties cannot be relied on to produce, under other conditions, grain of similar high qualities. Hence, for each zone marked with similar climatic conditions, a wheat suitable to it should be selected and grown. If the variety is not in existence it may be bred. The commercial importance of this is manifest in countries where the latitude of the wheat-growing areas stretches over long distances, as the best economic utilization of the grain depends on the proper blending of that from different zone areas.

Very interesting and important data could be furnished for both commercial and scientific purposes were the gluten-content and the quality of the gluten of the F.A.Q. standard wheat determined each season. The demand for the best wheats by merchants would create competition among them and foster the spirit of enterprise between growers in the direction



2. A DISSECTED SEMI-DURUM.

(1) Ear of Semi-Durum (Medeah x Purple Straw) showing one row of spikelets removed. (2) Complete ear. (3) Ear with upper florets removed exposing crease of grain in under set of florets. (4) Hairy rachis with terminal and part of lateral spikelet. (5) One side of ear illustrating the spikelets dissected and arranged in order. (6) Dissected ear illustrating the rachis, and the rachillæ alternately arranged on both sides of it. (7) On the left, illustrating the arrangement of the grain on the rachis; on the right, illustrating the rachillæ with aborted floret at the end of each. (8) Ear showing the grain after the outer and inner glumes of each row of spikelets have been removed. (9) Side or lateral view of ear. Note the solid straw.

of growing high class wheats where the factors bearing on success lay with the choice of variety; and, where they depend on methods of cultivation, thought would be concentrated in that direction.

PROLIFICACY VERSUS QUALITY.

The wheat areas of Northern Victoria have been proved to be eminently suitable for the starchy wheats. Under present conditions, however, it is useless to attempt to grow the Fifes, the wheats that bring fame to the Canadian grower. But it is possible to so improve the varieties naturally suited to the country that they may rival or even out-do the Fifes. The

wheat-growers of Canada and the United States do not, by any means, generally grow the best wheats available. They seek for the prolific rather than the best milling variety; but it is only a matter of time when the agriculturist in every wheat-producing country must be seized with the importance of growing the latter. Strong commercial needs evolved from a general public opinion will then play no small part in determining what varieties shall be produced; and it is reasonable to expect that the country that produces what is most in demand will prosper.

In order to encourage the settlement of the poorer land on which that hardy plant, wheat, alone can at present be grown with commercial success, a hard-and-fast rule cannot be laid down, but time will permit the experimenter to produce suitable varieties that can be grown successfully in every district and on every soil that may reasonably be suited to the nature of the plant.

Prolificacy in wheat depends on several factors, of primary and of secondary importance respectively. These may be considered under three main divisions, viz. :—

(*a*) Climatic conditions;
(*b*) Soil conditions;
(*c*) Inherent qualities of the variety.

Climatic Conditions.—The climatic conditions naturally form the chief factor in the successful growth of wheat, as with all plants. While wheat lends itself to successful growth over wide latitudes and at various altitudes, still much discrimination has to be shown in the selection of varieties for special conditions of soil and climate. Naturally, the varieties that are successful in the warmer parts of India will not succeed in Northern Canada, because either the variety chosen has not the constitutional power to thrive under conditions differing widely from those of its native habitat, or it is, owing to its cellular structure, constitutionally unable to withstand the attacks of diseases; or, since the environment is unsuited to the proper development of the variety, it is, perhaps, unable to form toxins that check disease.

That the quality and prolificacy of a wheat vary with the soil and climate makes the work of the experimental station a necessity. There, the breeding and selecting of varieties to suit the varying conditions to be met with, takes place. It is not enough to produce only high-quality wheats. That can readily be done; but to implant in such wheats the quality of prolificacy requires patient research, often extending over long periods.

Unless a wheat pays to grow, it is of no use to the farmer, however high in quality it may be. Once the prolific, high-quality wheat is in his hands, it is his business to so arrange the soil conditions that the crop may develop and produce a maximum return. Here he sometimes fails, and blames the variety selected.

Soil Conditions.—The soil conditions necessary to insure success are included in the following:—

A sufficiency of plant food in the soil proportionate to the maximum quantity of the soil-moisture that can be stored or given to it by rainfall during the growing period;

Proper drainage conditions so that excess of moisture may pass off;

A proper physical condition of the soil in order to insure a firm seed bed and to allow of root-development, and, in dry districts, to increase the moisture capacity of the soil;

A reasonable sufficiency of humus in order to ameliorate the temperature conditions of the soil and to encourage bacterial development;

And, above all, to so arrange the rotation that in good soils the soil-fertility will be maintained, and in poor ones increased.

The most important point to be impressed on those who wish to go on the land is the necessity of knowing the conditions that insure success: then intelligent methods can be put into practice and those of the empiric abandoned. And, as conditions vary in every district, methods need modifying in order to meet them. Whether the inferiority of soils apparently rich in plant food is due to the excess of poisonous excretions of plant roots, or to the failure to maintain a proper soil-texture, it is apparent from practical experience that success will be assured by a proper rotation which includes the building up of the humus-content of a soil when deficient in it. This is especially marked in the wheat-growing areas of this State. In Victoria, unfortunately, owing to a lack of population, a more diversified system of farming cannot be adopted, except in certain favorable localities; but the farmer who is able to profitably carry on mixed farming has a simpler problem before him in maintaining the soil-fertility, and, so, the prolificacy of his crops. A rotation must, of necessity, include as frequently as possible the standard money crop, provided always that the soil-fertility is maintained; and, while owing to fluctuating markets, a fixed rotation is not always advisable, the main issue—to keep the soil fertile—should receive paramount consideration. At the Dookie College farm it has been demonstrated practically that, if the soil is well prepared, and this is especially true of rising land, peas and rape sown in March and April will thrive and produce payable returns of fodder for sheep and cattle during the winter, and at the same time prepare the soil for producing prolific cereal crops.

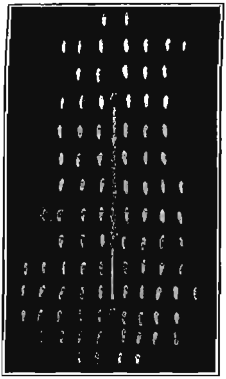
As regards climatic conditions, there are no parts of Victoria where wheat will not grow; but in the coastal districts the ravages of rust may prove a bar to its successful development, and in any case the quality of the grain would not be equal to that from the North. Still, it seems to be only a matter of time when rust-resistant varieties will be bred, and thus make it possible to grow wheat successfully in almost every part of the State.

Inherent Prolificacy of Varieties.—When the soil and climatic conditions are favorable, the prolificacy of any given variety of wheat depends on its inherent qualities. A cursory inspection of the twenty or thirty thousand varieties of seedlings growing in the College experimental fields impresses this on the most casual observer. What frequently appears somewhat unaccountable is the fact that, under most favorable conditions, one wheat may far outdo the yield of another, yet, when the conditions are less favorable, the latter wheat produces a more satisfactory return than the former. This demonstrates the necessity of determining the varieties best suited for the different parts of the Commonwealth. The conditions on which depends the prolificacy of a wheat are apparently as follows:—

(*a*) Well developed root system;
(*b*) Strong tillering or stooling property;
(*c*) Long ears;
(*d*) Dense or close ears; or an increased number of rows of spikelets per ear;
(*e*) Increased number of fertile florets per row of spikelets;
(*f*) Large and heavy grain.

ROOT SYSTEM.

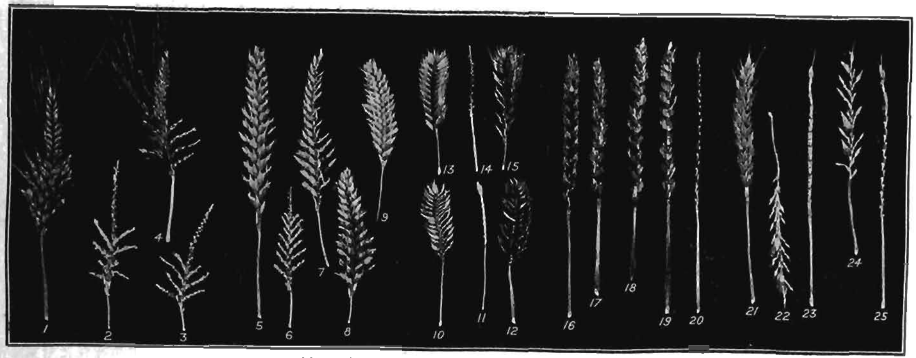
A well-developed root-system is the foundation of success, provided the development is in the direction of making the most of the opportunities presented; and, for this to obtain, a firm seed bed is essential. Naturally, the quick-growing varieties must have plenty of plant food at hand, and this is found chiefly in the surface soil, where the drainage is best. Again, a vigorous root-system, where the rootlets branch frequently and present numerous growing points, encourages rapid development and ripening. Varieties with stronger root-systems are not dependent only on the plant food near the surface, but are able to penetrate to the lower layers of the soil and subsoil; sometimes, when the subsoil is in a healthy condition, penetrating it for a distance of several feet. These strong-rooted varieties are later in ripening, and, should they have the tillering quality pronounced, are irregular in ripening, and are for that reason sown thicker, in order to hasten the ripening and make it more even. The roots do not, perhaps, obtain much nourishment from the subsoil, but by good tillage the moisture stored in it supplies the richer surface soil with the means which enable the greater number of the rootlets to perform their functions unchecked. Irrespective of the check caused by the inability of the roots to properly perform their functions, owing to insufficiency of moisture, the development of the plant receives other checks by the drying of the root-hairs and by the snapping and bruising of the rootlets, due to the contraction of the soil that has lost much of its moisture.



3. GRAIN FROM THE EAR OF A PROLIFIC CLUBBED CROSSBRED.

Arranged as taken from the spikelet, 95 grains of the 98 showing; r. r. rachis and part of upper internode illustrating the solid straw.

It is advisable to dwell a little on the question of root-development, for on it depends to a considerable degree the prolificacy of a variety; and an appreciation of soil physics as applied to farm practice may then be more readily attained. In dry districts, where the soil is good, the conservation of moisture is a dominant factor; and, generally, the greater the thoroughness with which the work is done, the greater the success. Where the foliage is abundant, it is still more essential that thorough cultivation should be carried out and thus a good supply of moisture made available, otherwise the hot winds of early summer have too much surface to work over, with unfortunate results as regards the yield. Such varieties are more suited for districts having a good rainfall and a genial ripening season. Strong flag-development, especially in the later stages of growth, is not advantageous in dry districts and it is frequently associated with good tillering properties, which are also, as a rule, a disadvantage in these districts. During the early stages of the growth of a wheat plant, an abundance of leaves naturally manufactures much starch and other



4. DISSECTION OF DIFFERENT FORMS OF WHEAT EARS.

(1) An ear of the Mummy or Miracle wheat type. (2 and 3) Illustrate the frame on which spikelets are arranged. (4) Illustrates one side of ear from which the spikelets have been removed showing the modification of the rachillæ into branches of almost the same stoutness as the rachis. (5, 6, 7, 8, and 9) New types of ears formed at Dookie Agricultural College by crossbreeding and selection (not containing Mummy blood). Dissections showing frame work of ears are also illustrated. (10) One side of clubbed seedling dissected, illustrating the closeness of the rachillæ on which the florets are arranged. (13) A complete ear. (11 and 14) Side and front views of rachis. (12 and 15) Clubbed ears partly dissected. (16, 17, 18, and 19) Views of Federation type of ear. (20) Rachis of same. (21) Ear of Improved Steinwedel. (22 and 24) Partly dissected ears. (23 and 25) Views of rachis.

nutrients, which are stored up and made available as soon as the stems and flag are ready to complete the work of forming the ears.

Possibly the reason that the nitrogenous fertilizers as a general rule act detrimentally in the northern and dry parts of the State is that they tend to produce flag-development and late ripening, thereby increasing the chances of loss due to the action of the hot winds early in November. Doubtless, the natural conditions as regards climate are very favorable to the formation of nitrates, but it is not often that the methods of farming adopted give Nature a chance; for, during the summer, the lack of moisture and organic matter in most of the soils checks nitrification. Where the conditions are favorable for nitrification, the effect of hot winds is not so severe because, owing to the greater capacity of the soil for retaining its moisture, the root-system has that moisture available to replace that given off by the leaves.

THE STRAW.

The culms or stems, viewed from a practical standpoint, should supply the needs of the plant and of the agriculturist respectively. The strength and flexibility of the straw, its length, its fineness, and its feeding properties are, roughly, the main practical considerations that interest the farmer. And on the relative development of these qualities the selection of a variety for any given locality depends. A good hay wheat should have long, fine straw, which is rich in palatable nutritive matter and which possesses the proper marketing qualities as regards colour and weight. For silage-making, stems that are solid, or nearly so, are more suitable, hence the breeding of solid-strawed varieties has been carried out at the College, not only for silage-making, but for grain also.

Returning to the more important feature of this paper—the prolificacy of wheats—and dealing with the question first from the practical standpoint, the main consideration as regards the stems is that they should be strong and flexible in order that they may stand until harvested. On wind-swept plains and where the straw is not needed for fodder, short-strawed varieties should be grown. But where, owing to the lack of moisture, the growth is not sufficient for practically harvesting the crop, the use of these varieties is not advisable.

At the end of January, almost all the straws in the 5,000 plots of wheat grown this season at the College farm, were still standing. There were not 10 per cent. of the wheats with really weak straws. Up till the year 1893, when only some 600 varieties were grown, 40 per cent. of the varieties had weak straws. By selection and cross-fertilization, the stiffness of the straw of varieties has been intensified and, there being less loss in harvesting, what may be termed the net prolificacy has been greater.

The length of the straw is an important factor. Where the rainfall is a fair one, and where the straw is not required as fodder, a medium length, say from 3 to 4 feet, is, in the case of most varieties, quite sufficient to bear a heavy yield. Where the straw is longer, and, sometimes, even as long, the wind in exposed situations lashes the crop about with such force as, in most varieties, to thresh out much of the grain. For this reason, the making of varieties on short straws has received a good deal of attention here, as it did by the late William Farrer, the father of wheat-breeding in Australia. To him we are indebted for Federation, one of the most prolific varieties grown to-day. Owing to its short, stiff straw, which is really one of its chief virtues, it is generally not a suitable hay wheat. Some years ago I made a number of crosses with Federation as one of the parents, and I am pleased to be able to say that this season there is a

promise of excellent results both in prolificacy and in quality. Some of the progeny have red chaff, while the remainder are white. The grain is plumper than the Federation grown in the same paddock. It will, however, be another year or two before the milling test can be carried out, as all the seed at present in existence is required for sowing. And until the new varieties have been tested under field conditions, their interest to the farmer lies mainly in the fact of their relationship to such a well known variety as Federation.

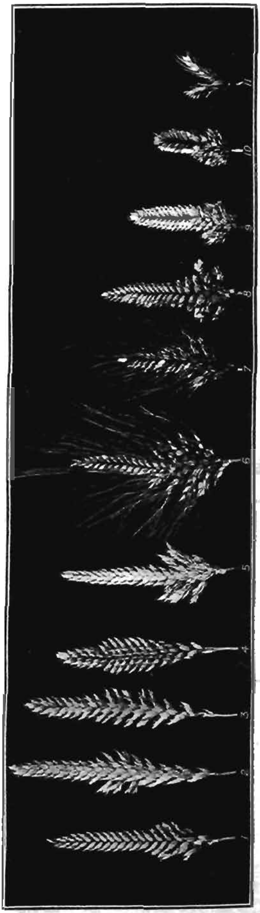
The Power of a Variety to Hold Its Grain.

The practical quality most desired in a prolific ear is its power to hold the grain and yet permit of its being properly threshed or harvested by the farmer. Among the crossbred seedlings there are many prolific varieties, but they are so difficult to thresh that they are useless for cultivation; on the other hand, there are some that are useless for the opposite reason—they shed their grain too readily. Such varieties are of interest only to the wheat-breeder. To illustrate the different forms in which prolificacy is made manifest, a number of ears have been collected. These include principally the forms produced by myself during the last fifteen or sixteen years, mostly by cross-fertilization, but, in other cases, by selection of ears showing mutation or a departure from the normal.

The simplest way to increase the prolificacy of a variety is to increase the rachis—that part of the stem on which are arranged the spikelets which form the ear. This lengthening of the rachis is naturally accompanied by additional rows of spikelets, usually wide apart and forming what is generally known as an "open" ear. To condense the rows it is necessary either to shorten the rachis or to develop more rows in the same length. In order to increase the prolificacy of the variety the latter object is the one to be aimed at, but it is not readily achieved. In the plots this year were some ears 10 inches in length, but they were rather open and contained less grain than some varieties only half as long. These very long-eared varieties are, for such varieties, more prolific than the varieties from which they were derived, but only because they have a few more rows of spikelets. There are about sixteen rows of spikelets, and five florets to each spikelet, usually two or three being fertile and the others abortive. These abnormal developments of the ear are the outcome of the variety being grown under the best conditions. The experiments in this connexion are not complete owing to the question being of secondary importance, and to the want of facilities, especially as regards time to devote to the matter. Still, the illustrations might excite the interest of some young and progressive agriculturists.

The length that can be attained by the rachis appears to be limited, for when the conditions are favorable to a splendid growth and ripening, the tillering is increased; and, instead of the spikes increasing in length, they increase in number. Provided the straw is strong enough, the wheat-breeder endeavours to increase the number of rows of spikelets, and either to increase the number of florets in each spikelet or to crowd more spikelets on to the joints of the rachis. This tends to make the ear more or less irregular in shape. It is only when the season is favorable that these abnormal spikelets are well developed; and it will be noticed that only the well developed ears on any given plant show in any marked degree the increase in the number of spikelets.

The well known Mummy or Miracle wheat, which has been grown here for over twenty years, has several smaller ears branching from the lower part of the rachis, the rachillæ being modified into strong branchlets.



5. BRANCHING EARS ILLUSTRATING A FORM OF PROLIFICACY.
(4) A new type of ear with the branchlets closely packed and developed from No. 2. Originated at Dookie. (8, 9, 10) Bald branching seedlings, originated at Dookie.

otherwise it is scarcely noticeable. Even the branchlets re-branch occasionally, this being more apparent in crossbred seedlings from it. There are a number of other varieties that have this branching habit, most of them being produced here by selection and cross-fertilization. Some of these are bald, and they, perhaps, have advantages over the bearded Mummy wheat, which, in a few instances, is one of the parents. Some varieties show the development of branchlets almost from the base to the apex of the ear, though the branchlets are not as long as those of a well-grown ear of Mummy wheat. An effort will be made to develop them. Perhaps no real practical purpose would be served, except to the wheat-breeder who wishes to intensify the yielding properties of another variety; for there is a limit to the size to which the ear should be developed, and this is more or less dependent on the physical attributes of the straw, the climatic conditions, and the methods to be adopted in harvesting the grain. The Mummy wheat is of no practical value; but it is possible to develop from it better-quality varieties that may serve a useful purpose.

Branching Wheats.

Among the varieties produced by cross-fertilization are some in which the rachilla is prolonged, and arranged on it, alternately and rather wide apart, the florets. This arrangement, when only a few rachillæ are developed, gives the ear a fretful appearance (see Plate 5, Fig. 2); and, when the development is general, forms a broad, flat ear (Fig. 4). A few of these varieties have a strain of a selected Bearded

The development of new spikelets appears to be inherent in many wheats, including the common varieties when the conditions are favorable to a good harvest. Under such conditions, there frequently appears, at the shoulders of the rachis, two spikelets where only one is generally seen (Plate 6 (15). By constant selection, this quality becomes more intensified, especially when crossing types both of which have this abnormal development. The above peculiarity I have more frequently noticed on the square, prolific, dense ears, than on the open ears. It is not a specially rare thing to find two ears growing on one stem. As a rule it is due to abnormal development and is not a mutation, because the characteristic is not perpetuated. This season several such ears were found on different plants; in each case, with the exception of the one mentioned below, all the ears except the one being normal. On one occasion, two stems each with two ears were found on the one plant, but the ears of

6. FORMS OF PROLIFIC EARS ORIGINATED AT DOOKIE AND STILL UNDER OBSERVATION.

(1, 3, and 5) Ears containing Federation blood. The lower part of the outer ear on the right illustrates the duplication of the rows of spikelets. This may be noted in 7 and 13.

the better-developed pair did not measure more than an inch and a half in length. In some cases the presence of two ears was possibly due to the central rachis being injured, and, owing to the good season, the inherent quality of throwing out new spikelets possessed by some wheats may have been stimulated. In view of the many malformations due to insects, bacterial influence, sap-circulation, &c., a paper dealing with these alone would prove of interest.

CLUBBED VARIETIES.

Clubbed wheats are usually short in the ear and in the small space between the apex and the base of the rachis are packed many spikelets and florets. Club-tipped ears are very common among some of the Purple Straw varieties, and this fact is most apparent during a good season. The presence of this characteristic sometimes gives the impression of impurity of variety. Those clubbed wheats which are on short, stiff straws

are suitable for exposed situations. Some of the varieties are prolific and hold their grain well, while others do not. Generally speaking, the small, clubbed wheats are not as prolific as the bold, long, dense, tapering or the square eared variety. The latter variety is sometimes found with a clubbed top. A few types of clubbed ears may be noticed in the illustrations. The tight packing of the spikelets may be noticed in Plate 4 (10), where the closeness of the rachillæ is also shown.

THE WEIGHT PER BUSHEL.

The size and weight of the grain is an important factor and it frequently determines the comparative prolificacy of the varieties. The size of the grain is not always a criterion of the weight per bushel, as we find by experience that the small, dense, thin-skinned grain often weighs more per bushel than the large-grained seed. This is because it is denser and packs better into the bushel measure. Of course, it may happen that the quality of the small grain is such that it weighs less per bushel than the larger grain.

From each of four rows of seedlings, two of which were of the Mummy type, and two in which Bearded Hunter's White was the male parent, I took an average, well-grown ear. The ear of one of the Mummy seedlings (*a*) contained 123 grains. It had a slightly clubbed tip. The ear of the other Mummy seedling (*b*) contained 105 grains. The other two ears (*c*) and (*d*) had 92 and 72 grains respectively. On weighing the grains from each ear, the following was the result:—

(*a*) 123 seeds weighed 4.95 grammes.
(*b*) 105 seeds weighed 4.15 grammes.
(*c*) 92 seeds weighed 5.07 grammes.
(*d*) 72 seeds weighed 5.00 grammes.

There was little difference in the tillering properties of these varieties, but the last (*d*) had straw that was barely stiff enough; yet, in order to test their power to withstand the adverse weather conditions, all had been left standing a month after the usual time for harvesting. I usually allow the wheats to remain unharvested for a considerable time. This tests the strength and stiffness of the straw and the holding power of the ear; and, where Spelt and Emmer blood enters, the brittleness of the ear also is tested. Wheats which pass this severe test have then to be tested for prolificacy and quality.

Experiments have proved that however prolific a wheat may be, it is only when the conditions under which it is placed are practically perfect, that it will give phenomenal yields. Where the natural conditions are not perfect, then the farmer must, as nearly as possible, so regulate his efforts as to bring about the desired result. Bare fallowing has done much towards making the dry areas grow splendid wheat in payable returns; but virgin soil has a good deal of organic matter in it, and this is, by careless cultivation, gradually reduced, rendering the soil less fertile. It is a pity that conditions are such that in many places it is found expedient to burn the straw. When this is done it causes a loss of much organic matter, and but a trace of inorganic substance is given back to the soil.

Some farmers appreciate the limitations of the wheat plant, and understand when and how to perform their part in order to bring about such conditions as will render possible the highest development. These men are fully aware that the work of the wheat-breeder is only part of the means necessary to success. When the breeder has produced a prolific wheat containing a high percentage of gluten of good quality, he has done a good deal. He has done still more if the variety possesses a stiff

straw and is storm-proof But this last-mentioned quality should not be developed too strongly, otherwise a loss is made in harvesting because of the grain not being readily separated from the chaff. Some wheats, otherwise good, are rejected for this reason.

The variety of high gluten-content is most useful for blending with starchy wheats, in order to produce bread wholesome and easily masticated. The dough of the flour of wheat of high gluten-content is more difficult to knead, but this difficulty disappears where the work is done with machines.

SEMI-DURUMS.

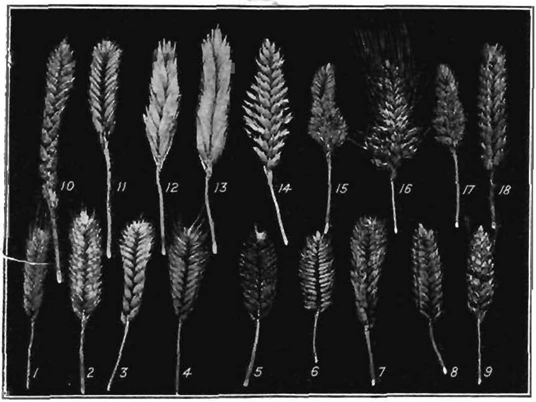
Among the semi-durums bred at the College are a number of bald ones, derived principally by crossing Medeah, a durum wheat, with a bald variety of common type. The strong influence of the Medeah is marked in almost all the progeny, especially as regards the colouring. It is in this way that the bald Medeah varieties have been produced, several having been grown here for a number of years.

The variety Purple Straw x Medeah is represented in Plate 2; (2) gives a side view of the spikelets arranged on both sides of the rachis. It will be noticed that the rachis shown in Fig. 4 is very hairy compared with that of Federation and some of the other wheats illustrated. Fig. 9 gives a view of the same variety turned at right angles showing the rows of spikelets. Fig. 1 presents the underside of the rows of spikelets and shows how they are attached to the rachis. Fig. 8 illustrates the setting of the grains in the spike or ear (in order to show this two of the glumes have been removed from each spikelet). It happens that in this specimen all of the florets are fertile, except one or two at the apex. Twenty-three grains are depicted, with the rounded or bosom part turned outwards. In the next figure, No. 3, a side view of the florets is seen; also a view of the line of grain with the crease side uppermost. Fig. 7 shows a line of grain similar to those in Fig. 8, but on the right-hand side may be seen the central and diminutive florets with their attachment to the rachilla, while below are other florets. Fig. 6 is a good illustration of a dissected ear showing the rachillæ along which the florets are arranged alternately. The grain is not jambed into a corner, as is commonly thought, but takes a definite arrangement on the rachillæ, just as the latter are arranged on the rachis. This arrangement prevents the grain in an ear which is apparently very crowded in the spikelets from becoming misshapen. In Fig. 6 the terminal florets of each spikelet are shown. They either are not fertile, or being fertile have not developed any grain in them. Fig. 4 is a representation of the rachis, or axis to which the rachillæ and florets are attached. The one under notice is very hairy, both the basal rachis hairs of the spikelets and the lateral rachis hairs being long. In the Durums I have just examined, these hairs seem to be long, whilst in the Spelts and Emmer they are fewer, and in some instances almost absent. The zig-zag form of the rachis is shown in the different examples depicted. From the shoulder-like parts of the rachis, the florets and rachillæ spring; also the tufts of what are termed basal hairs. The functions of these hairs and of the lateral rachis hairs are not evident. It may be that they preserve a still atmosphere and check evaporation, and thus enable the ear to better withstand a drought.

By carefully dissecting the series of spikelets on one side of an ear, and laying out regularly the parts as detached, it will be noticed that a fairly large percentage of the florets are infertile or have no grains in them. (See Fig. 5.)

STUD SINGLE SEED PLOTS AT THE COLLEGE.

In these plots more than a quarter of a million seeds were sown by hand in drills 2 feet apart, the seeds being put in singly a link apart. It was thus possible to study the characteristics of any plant desired. If a critical examination of the ears be made during the flowering period, it will be noticed that some varieties appear to be richer in pollen-bearing anthers than others, and that the fertilization in the latter is often irregular. Thus their prolificacy is reduced. With perfect conditions, their yield may be equal to that of a prolific variety; but, as the conditions are seldom perfect, the hardy variety that bears an abundance of pollen is a more consistent yielder. Frost sometimes checks the fertilization of tender varieties, and diseases reduce the yield, either by checking the development of the grain, as with rust, or by converting the nutriment, as with smut.



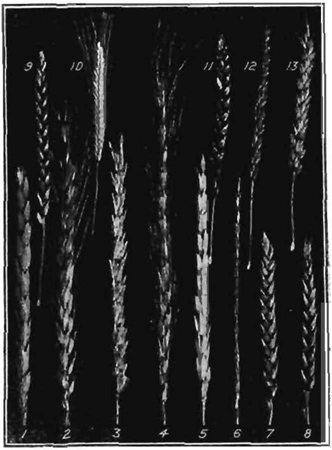
7. CLUBBED FORMS OF EARS OF SEEDLINGS ORIGINATED AT DOOKIE.
(10) Illustrates a club-tipped ear. (12 and 13) are bald Polish seedlings.

If the soil and climatic conditions are good, Federation is a prolific wheat; but in poorly tilled soils or where climatic conditions are unfavorable, it is not as hardy as some other varieties. Judging by the results in the plots devoted to bunt experiments, seed apparently affected has its powers of germination weakened. It often happens that there is more meat on a game fowl than on a Brahma that appears to be half as large again. In the first, the feathers are fewer and fit tightly to the body; in the second case, the feathers are many and fluffy. It is sometimes similar in the case of wheat-ears. A large ear with thick glumes may have only two fertile florets per spikelet, whereas an ear designed on finer lines may have on an average nearly three florets in each spikelet fertile, as was the case this year with Federation. Some wheats on reaching their maximum development have five fertile florets; but this does not often happen, usually the central one being infertile. There is one prolific variety the

ear of which, when well filled, has six grains to the spikelet, the seventh or central floret being infertile, though at odd times all seven florets in one or two spikelets are fertile.

PECULIAR VARIATIONS IN THE GRAIN AND ITS BEARING ON THE YIELD.

I have occasionally reported on the variations in grain due to the ripening being affected by climatic conditions. The self-evident results due to the absence of moisture, to the presence of fungoid pests, and to hot winds, need not be touched on except in so far as they apply to a peculiar variation which I desire to again specially bring under notice. Sometimes a sample of wheat will show horny, translucent grains, opaque grains, and others partly translucent and partly opaque. It frequently happens that farmers, on seeing this, come to the conclusion that the sample is of different varieties. Such is not necessarily the case, as with some varieties all three kinds may sometimes be obtained, even on the one plant. Yet in most cases the surmise of impurity is probably correct, as most of the varieties commonly grown do not show the variation. It would seem that, when ripening is gradual and the conditions generally are good, the opaque grains predominate in varieties subject to this variation. The presence of nitrogenous manures seems to affect the seeds, causing the horny or semi-translucent grains to predominate. Whether it would be otherwise were there no hot winds to rapidly ripen the grain, I have not had the opportunity here to ascertain, as the nitrogenous fertilizers lengthen the growing period and this extends to the time when the hot winds are experienced.

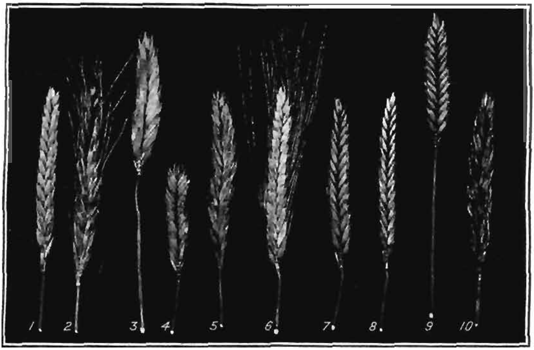


8. TYPES OF TAPERING EARS.

(1, 2, 3, 4, and 5) Seedling crossbreds originated at Dookie. The ear represented by Fig. 4 is 10 inches long. (6) A Spelt wheat. (7) Bunyip selection. (8) Jade. (9) Comeback. (10) Double Emmer. (11) Federation. (12) Stanley (a Fife). (13) Improved Steinwedel.

It is noticeable that when the soil is practically in its virgin state, and when it is in good heart, the evenness of the quality of the grain as regards opaqueness is usually assured in the varieties subject to the variation. Where the crop has been forced with dressings of phosphatic fertilizers, the abundant growth developed becomes as a rule prematurely ripe, and the semi-translucent and the opaque grains are in evidence. To insure the opaque, starchy-looking grains, gradual ripening appears to be the main factor, followed by fertile conditions of soil. Stimulated growth, rapid ripening, and premature ripening from whatever cause it may arise, determine more or less the semi-translucency of the grains. I am not in a posi-

tion to definitely state the cause, which may be due to several factors, acting either jointly or separately. The characteristic is rarely noticeable in the Purple Straw wheats, but in Durum, Poulard, and some Fife types and their crosses evidence of opaque spots or splashes in a semi-translucent base is frequently met with. The appearance of the semi-translucent grain would lead one to expect it to be relatively richer in gluten than the opaque grain, because it more nearly approaches in appearance the grain of some wheats of high gluten-content. It does not, however, follow that the wheat will be relatively rich in gluten. The translucency may be due to the thinness both of the walls of the starch cells and of the outside covering of the grain, *i.e.*, the bran; or it may be due to the absence of a medium checking the disintegration of the cells and so, the refraction of light.



9. BALD AND BEARDED POLISH CROSSBREDS ORIGINATED AT DOOKIE.

As a rule, the yield is higher when the wheats assume the more starchy appearance, as the variation in size is not so great. Thus, in the grading, the percentage of first quality wheat is higher than where the semi-translucency is more in evidence. It is only by building up our knowledge of natural conditions from minute details that it is possible to implant in any variety those qualities that make it desirable for practical uses. For this reason the improvement of varieties is a slow process.

With the establishment of a variety which will, under a proper system of cultivation, increase the output of the farmer even by a small fraction over that of the general class of wheats, a not inconsiderable amount is added to the wealth of the State. It is most probable, too, that the more general cultivation of wheat in the areas of better rainfall will have an appreciable effect on the average yield of the State. With a view to effecting a still greater increase in the yield, the elimination of losses due to fungoid pests has received no little attention. And the prospect of producing varieties that resist bunt, loose smut, and rust, is becoming more encouraging season by season. The physical attributes as regards good harvesting qualities are now readily implanted, thus checking other loss. Thus the introduction of prolific varieties that stand out in those attributes that commend them for practical purposes must, in conjunction with good methods of cultivation, bring prosperity to the wheat growers of this and

II.—FIELD OPERATIONS AT THE DOOKIE AGRICULTURAL COLLEGE, SEASON, 1908-9.

H. Pye, Principal.

The experimental plots arranged under the auspices of the Department of Agriculture throughout the State include a set of experiments carried out under my supervision at the Dookie Agricultural College. The seed wheat for these experiments was received already pickled and was similar to that distributed to the other stations. Accompanying the wheat was commercial superphosphate sufficient to give a dressing to the field at the rate of 50 lbs. per acre. Allowing for variations due to different sizes of the grain, the seeding was, as nearly as possible, 50 lbs per acre. The seed was drilled in with the manure.

The field set apart for the test plots had been in cultivation for over thirty years, being in use before the foundation of the College. It was cropped during 1906 and fallowed during 1907. During the spring of 1907 millets and maize were grown on it and kept well cultivated between the rows. After the best of the fodder had been cut, the remainder was grazed off.

On the 20th March, 1908, the field was cross-harrowed. On the 23rd April it was cultivated with spring-toothed cultivators, leaving the soil in a nice condition. It was then rolled, and on the 8th May the drilling in of the seed was commenced. On the following day it was completed. The observations bearing on the practical side of the work are given in the tabulated statements furnished.

On observing the sample of grain of Federation, it appeared to me to be uneven, hence during the grading of the grain for seed I had the weights of the six grades of each variety recorded. In the table given below it will be seen that Dart's Imperial with 92.04 per cent. of prime or first grade seed, heads the list, with Jade and College Purple Straw well up with 90.23 and 89.54 per cent. respectively.

DOOKIE AGRICULTURAL COLLEGE EXPERIMENTAL STATION.—SEASON 1908-9.

Name of Variety.	Yield per acre.		Weight per bush.		Percentages of the six different grades obtained after grading.						Percentage of marketable grain.
					Firsts.	Seconds.	Thirds.	Fourths	Fifths.	Sixths.	
	bus.	lbs.	lbs.	oz.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
Yandilla King ..	21	50	64	6	84.21	7.69	5.07	.63	2.06	.33	91.90
Australian Talavera	23	49	64	1	83.61	8.30	4.29	1.02	2.25	.52	91.91
Marshall's No. 3	25	35	63	10	84.22	8.88	4.55	.55	1.51	.28	93.10
College Purple Straw	30	42	64	14	89.54	6.55	2.01	.45	1.11	.33	96.09
Dart's Imperial	28	37	64	12	92.04	5.79	.72	.48	.60	.36	97.83
Jumbuck ..	28	53	64	13	87.21	7.17	2.39	.78	1.97	.48	94.38
Jade	28	33	66	2	90.23	4.84	2.66	.48	1.63	.15	95.07
Comeback ..	26	24	66	15	72.25	17.83	5.28	1.32	3.04	.26	90.08
Federation ..	29	48	64	15	76.12	14.13	5.42	.92	3.00	.40	90.25
Bunyip ..	24	11	64	9	84.09	8.94	3.55	.57	2.13	.71	93.03

Perusing the last column of the above tabulated list it will be noticed that Dart's Imperial returned the greatest percentage of marketable grain from each bushel graded, with College Purple Straw second and Jade

DOOKIE AGRICULTURAL COLLEGE EXPERIMENTAL STATION.—SEASON 1908–9.

Name of Variety.	Date Sown.	Area.	Seed per acre.	Fertilizer.	Above Ground.	In Ear.	Ripe.	Yield. bus.	Yield. lbs.	Remarks re Growth, Grain, Straw, &c. Grain.	Ears.	Straw.
Yandilla King	8.5.08	1 acre	50 lbs.	50 lbs. Superphosphate per acre	21.5.08	4.11.08	8.12.08	21	50	Large, pinched, angular; good colour	Fairly bold, stiffish, irregular; glumes somewhat difficult to thresh	Medium length; stiff and inclined to be brittle
Australian Talavera	8.5.08				19.5.08	3.11.08	8.12.08	23	49	A good even sample; long, fairly plump	Long, tapering; threshes easily; slightly open	Long and of good quality
Marshall's No. 3	8.5.08				20.5.08	3.11.08	2.12.08	25	35	Good size and colour; long, pinched	Good length; holds grain; threshes with some difficulty	Fair length; strong
College Purple Straw	8.5.08				20.5.08	29.10.08	8.12.08	30	42	Even sample; medium size; plump; good colour	Good, compact ear; slightly club-tipped; medium length; threshes well	Longest and most even straw of the ten varieties; good strength and quality
Dart's Imperial	8.5.08				22.5.08	1.11.08	9.12.08	28	37	Even sample; medium size; plump; good colour	Short; compact; club-tipped; threshes well	Medium length; stiff and strong
Jumbuck ..	8.5.08				23.5.08	28.10.08	7.12.08	28	53	Large; fairly even; dark colour; plump	Medium length; velvet chaff; compact; slightly tapered; easily threshed	Long; stout; good strength and quality
Jade ..	9.5.08				24.5.08	29.10.08	8.12.08	28	33	Bright; fair size; even	Long, tapered, thin; somewhat open; easily threshed	Long; fairly good quality
Comeback	9.5.08				22.5.08	22.10.08	6.12.08	26	24	Bright; small; plump; shotty grain	Medium length; thin, tapering; open; easily threshed	Long; fine and good straw
Federation	9.5.08				23.5.08	1.11.08	8.12.08	29	48	Smallish; fairly plump; fairly even	Red colour, though varied. Rather on short side; close, well-filled spikelets; holds; threshes well	Short, stiff
Bunyip ..	9.5.08				23.5.08	30.9.08	2.12.08	24	11	Medium size; good colour; rather brittle; fairly plump	Medium length; uneven; threshes easily	Long; clean; fairly brittle

third. The yield of the second was, however, 30 bushels 42 lbs. against 28 bushels 37 lbs. of Dart's Imperial and 28 bushels 33 lbs. of Jade. Federation returned only 76.12 per cent. of prime seed, but the seconds, 14.13 per cent. of the total weight graded, being perfectly free from oats, barley, and rubbish, sold well for milling purposes, as the grain, though small, was not pinched and was free from cracked grain, which was in evidence in the thirds and other grades. Comeback returned the lowest percentage of prime grain, and if the seconds be considered as marketable, the total percentage of marketable grain would be

90.08, the lowest on the list, with Federation next to it. It is somewhat doubtful if the graded seconds of Comeback would receive full market rates, the grain being smaller than that of Federation. Eighty or more bags of graded seconds of the last named wheat when sold in the open market obtained the full market price.

From the miller's standpoint the variety which, irrespective of other milling properties, gave the least amount of graded offal, should command the higher price, as there is a wide variation between 90.08 per cent. of Comeback and the 97.83 of Dart's Imperial or the 96.09 of College Purple Straw. Possibly the high gluten-content and quality of Comeback would narrow the relative worth considerably, did millers purchase wheat according to test of gluten-content and quality, but as this is practically not done, at least among grain buyers, then the variety that yields well and returns the least offal should command the best price.

It will be noticed in the second tabulated list that the relative order of the varieties coming into ear is more marked than the relative order of ripening. In reality there is a closer relationship, but, owing to the few hot wind days, the later varieties ripened rapidly and approximately about the same time as the earlier ones. This accounts to some extent for the variation in the size of the grain of each variety owing to the premature ripening of the lateral stools.

For many years I have contended that the great problem is to develop medium-large to large grained varieties of wheat rich in good gluten. This is because our climatic conditions do not as a rule allow of a gradual and even ripening of the grain, with the result that so much pinched grain is found during some seasons. If the variety is small-grained and pinched, it will not usually sell for milling purposes; if the variety produces large grain, then, even if pinched, it has a market value. In this respect I differ from several wheat-breeders I have met. They have endeavoured to acclimatize the Fifes of Canada, which have been grown for twenty years at the College. A number of these, though rich in gluten, are not suitable for Victoria generally, and when at the best here are only doubtful substitutes, as in Canada they grow under climatic conditions which, for these varieties, are ideal. The problem, then, is to so improve the varieties suitable to the climate that both as regards yield and quality they may compete successfully in the open market with the best produced in any other country. I would suggest that sufficient of the standard varieties from the different stations be in future sent to a common centre and there mixed in order to strike the weight per bushel for comparison with the F.A.Q. sample of commerce. I believe, too, valuable data for future reference could be obtained if the original F.A.Q. sample of grain of each year be tested for gluten-content and quality.

A considerable number of crosses between varieties have been made by myself and my enthusiastic assistants. I have some promising crossbred varieties in which Federation blood plays a conspicuous part. Over 200 experiments relative to the production of bunt-resistant varieties and the effects of fungicides have been carried out by me and will be considered in a future report.

THE NON-GERMINATION OF CERTAIN SORTS OF BARLEY.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Professor of Botany in Melbourne University.

It is a fact of common knowledge that certain sorts of barley are incapable of giving immediate satisfactory germination, even although each grain contains a living embryo and is sound in every way. That fact is sometimes a very serious matter to maltsters, since the disposal of large quantities of stored grain which has proved unsuitable for malting usually involves considerable loss. Irregular germination is no use to the maltster, but samples showing irregular germination on first testing may after storing for a time give a satisfactory germination. In other cases, however, the grain remains unsatisfactory, and largely refuses to germinate under the conditions required for the making of good malt. Apart from the interest on the capital represented by the stored grain, and from the cost of storage, the germination capacity ultimately begins to decrease, so that in the long run such grain may need to be discarded, usually at a low price. The amount of money involved in large businesses may easily run into thousands of pounds.

Messrs. Barrett Bros., the well-known firm of maltsters, recently forwarded samples of grain at my request which exhibited this peculiarity. The grain was a form of Victorian grown Cape barley, apparently thoroughly sound and good. It was harvested in fine weather with the thermometer above 90° F., and probably ripened rapidly. The only noticeable peculiarity about the grain is, however, that the germ appears rather small. The grain has been experimentally tested, both at the malting establishment and at the University. In the first malting tests, after soaking in water at 55-65° F., and then keeping the grains at air temperature only 10 per cent. on the average germinated satisfactorily for malting purposes.

After treatment with chlorinated lime water (45 grains per gallon), about *18-20 per cent. gave good germination, another 18-20 per cent. developed* radicles, and the rest failed. Kiln sweating, followed by ordinary floor germination, was tried but was not found effective. Similar soaking in saline solution, or in lime water (10 grains per gallon), had no appreciable effect.

Mr. Arthur Barrett informs me that in some cases after the grain has been knocked about in transport or by passing through the elevators he has noticed a rise in the germination capacity. It is possible, therefore, that the deficient germination may be due to the palea or scaly covering of the barley hindering the entry of the water and oxygen required by the germinating seed. The palea might either be more impermeable or relatively thicker than usual. When the embryo is of normal size, it soon swells and forcibly distends the palea, but when the embryo is small and the palea of the same thickness as in an ordinary grain it must exercise a relatively greater binding and compressing force upon the smaller embryo.

If this is so, stripping off the palea, or its partial solution by immersing the barley in strong sulphuric acid, or the action of a high temperature which favours the entry of water and oxygen should all tend to increase the percentage germination. Experiments carried out at the University showed conclusively that this was the case. The experiments were performed during a warm spell, the average room-temperature being 25-30° C., so that the results in the germination chamber are but little better than

those obtained at room-temperature. A later series when the temperature averaged 20° C., gave a much lower percentage germination.

Treatment.	Germinated after—			Total.
	1 week	10 days.	14 days.	
Soaked, and at 25–30 C.	54 %	5 %	6 %	65 %
Soaked, and at 20° C. appr, ...	22 %	18 %	6 %	46 %
Soaked, and in germ. chamber at 30 C.	61 %	5 %	3 %	69 %
After 1 min. in boiling water	nil.	nil.	nil.	nil.
After 1 hour in water at 70° C.	"	"	"	"
After 10 mins. in concen. H_2SO_4	51 %	10 %	4 %	65 %
Palea stripped off over embryo.	76 %	6 %	...	82 %

The two last experiments were carried out at room-temperature (25-30° C.), so that the treatment with sulphuric acid only favours germination when the comparisons are with untreated grain germinated at low temperatures.

After the barley has been in the concentrated sulphuric acid for five minutes the whole is completely black and apparently the seed quite spoilt, but after washing and neutralization with ammonia or lime water the grain is seen to be sound and of good colour. The latter, however, slowly alters again, the resulting malt having a rather bad yellowish or brown colour. In addition the cost of the treatment would be heavy on a large scale,* and the fact that sulphuric acid is often contaminated with arsenic would bring a risk into malting which past experience has proved to be a real one.

Mr. Barrett informs me that germination at a high temperature tends to bring so much of the phosphates and proteids of the seed into a soluble form as to result in the production of a poor class of malt unsuited for brewing a good clear beer, and especially apt to become contaminated with detrimental micro-organisms.

To strip off the paleæ on a large scale is not possible to do at any reasonable cost without destroying or damaging the germ, and exposing the endosperm. Whether soaking the seeds in warm water under high pressure, or in water saturated with compressed air or oxygen, would be effective is doubtful, and special apparatus would be necessary to carry out such experiments on a reasonably large scale. There are, however, other ways in which germination can be stimulated in seeds. For instance Nagaoka found that the germination of rice was favoured by the action of a dilute solution of manganese sulphate, and Bertrand found the same to be the case with oats.† Micheels and Dehein‡ have found that colloidal solutions of various metals (tin, platinum, manganese), prepared by passing a high voltage current between plates of the metal suspended in water, exercise a stimulating action on the germination of peas, wheat, barley, and other seeds. They also state that, in the presence of metallic salts, the passage of a weak continuous electric current through the water on which the germination trays are resting, favours germination if the

*The sulphuric acid could be used repeatedly if the grain was dry, but even then the cost of treatment might exceed 1s. per sack for the acid, while the manipulation on a large scale would be somewhat difficult and dangerous.

†Nagaoka, Bull. College of Agriculture, Tokyo, 1904; Bertrand, Compt. Rendus, t. CXLI., 1905, p. 1255.

‡Acad. Roy de Belgique, Bull. Cl. des Si., 1905, No. 7; 1906, No. 5; 1907, No. 2, 1907, No. 12.

current is not too strong, and that a mixture of colloidal solutions of metals has a greater stimulating action than the same solutions when separately applied.

The influence of manganese sulphate was tested by dipping the seeds in 0.2, 1, and 5 per cent. solutions of the salt for 1 and for 3 hours, followed by washing and soaking in water, and germination at 25-30° C., with the following results.

BARLEY SOAKED IN MANGANESE SULPHATE SOLUTION FOR 1 HOUR.

Strength of Solution.	Per Cent. Germination after 5 Days.	Per Cent. Germination after 22 Days.
0·2 %	12	48
1·0 %	14	68
5·0 %	28	46

BARLEY SOAKED IN MANGANESE SULPHATE SOLUTION FOR 3 HOURS.

Strength of Solution.	Per Cent. Germination in 5 Days.	Per Cent. Germination in 22 Days.
0·2 %	16	50
1·0 %	12	44
5·0 %	34	48

The chief effect of the manganese sulphate appears to be to hasten the germination of a small percentage of the seeds. This action is best shown by the 5 per cent. solution. The total germination is, however, but little affected, and is if anything depressed, except in the case of the seeds immersed for an hour in a 1 per cent. solution. In most of the seedlings the root-development was excessive before the plumule escaped, so that the malting value would be poor. After three weeks a few seeds in each sample were apparently still sound but showed no signs of germination. Such would be quite useless for malting purposes and hence the tests were not continued further.

Even had treatment with manganese sulphate proved satisfactory, the serious question of its effect on the malt would have been necessary to consider. The 5 per cent. solution discolours the grain somewhat, and very possibly the same stimulus which hastens the germination of some of the stronger grains prove fatal to those in a weak condition.

The only remaining method of chemical treatment would be by colloidal solution of metals, which is practically akin to electrolytic treatment. Unfortunately, no properly equipped seed testing laboratory exists in Melbourne, and the Botanical Department of the University has neither the space, means nor apparatus required to carry out a research of this character to a satisfactory character. A supply of the seed has, however, been forwarded to Professor Adrian Brown, Professor of Brewing at the University of Birmingham, who is one of the world's authorities in regard to such matters and who may possibly be able to suggest further lines of investigation of a practicable conclusion. In the meantime, the only treatment of any value appears to be given by stripping off the paleæ (adherent husk), but it is doubtful whether any satisfactory method could be devised of doing this cheaply without injuring the germ, and so rendering the barley useless for malting purposes.

If the palea acts by retarding the entry of oxygen and so maintaining within the seed a percentage of free oxygen insufficient to excite germination, then it must do so in some special manner, for experiments performed with the seeds under an air pressure of 2-3 atmospheres did not show any increase in the rapidity or amount of germination. The soaked seeds were placed on blotting paper in a strong flask, which was attached to a large cylinder of air at a pressure of 3 atmospheres. An exit tube from the flask terminated in a considerable length of fine capillary tubing placed under water, so that the stream of minute escaping bubbles only represented a very slow current of air through the flask. The total germination was, however, lessened, and its rapidity lowered. Thus, after the first week, only 8 per cent. had germinated, whereas 32 per cent. had germinated of seeds in an open dish in the same time at 20·25 deg. C. Possibly the slow current of air, by aiding evaporation, keeps the temperature lower within the flask than it is outside, but if the flask is filled with air at 3 atmospheres, and then closed, the accumulating carbon dioxide prevents any germination at all.

DEVELOPMENT OF THE TOBACCO INDUSTRY.

The following figures in relation to the tobacco industry show the progress made since Mr. Temple A. J. Smith was appointed Tobacco Expert in 1901 :—

Season.	Number of Growers.	Acreage.	Produce of Tobacco. Dried Leaf in cwts.
1901–02	17	103	345
1902–03 .. .	24	171	781
1903–04	25	129	848
1904–05 ..	20	106	1,112
1905–06	31	169	1,405
1906–07	30	133	603
1907–08	49	345	1,767

It will be noted that the number of growers, and also the area under cultivation, has been trebled, and that the yield has increased in still greater proportion. The low yield of 1906-7 was due to the exceptionally bad season. For the present season, 1908-9, the area prepared for the crop considerably exceeds any of those quoted.

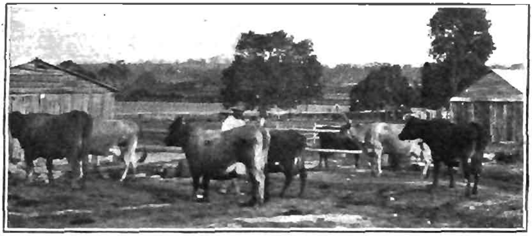
One of the most pleasing features of the development of the industry is the fact that Victoria can and does produce a good quality cigar leaf, although it was predicted by several manufacturers that it would be impossible to grow cigar leaf under prevailing climatic conditions. Another proof that Victorian leaf is improving in quality, is shown by the increased prices obtainable. The pipe tobaccoes now sell at 7d. to 9d. per lb., while for cigar leaf 1s. to 1s. 6d. has been obtained, and, in one instance, 2s. per lb.

The foregoing figures will give some idea of the value of the crop to producers. Crops of 1,000 lbs. to 1,500 lbs. of cured leaf per acre are not uncommon, the value at present prices being from £30 to £40 for pipe tobaccoes, and as high as £100 per acre for cigar leaf.

PROFITABLE DAIRYING ON SMALL FARMS.

J. S. McFadzean, Dairy Supervisor.

Every dairy farmer should strive to obtain as much remuneration from his herd as his circumstances will permit. To materially increase the profits from his business without making a corresponding expansion in the cost of production should be his daily thought; for such an increasing of the returns cannot but be satisfactory. When, therefore, a dairy farmer is so located that he is within reasonable distance of a constant demand for fresh milk at a payable price, he should endeavour to get a due share of the trade available. Occasionally, cases may be met with where special circumstances preclude the possibility of making this line of business fit in with some other work on a farm; and in such instances the opportunity must be let pass. As a general thing, however, it must be conceded that, should a dairy farmer continue to separate his milk for cream-selling or butter-making, when he could as easily take part in the wholesale milk supply business, he is not taking full advantage of his opportunities.



SIX HERD MOTHERS.

A gallon of standard milk is worth from 3d. to 4½d., according to the season, if separated or sold on its butter-fat content. But that same quantity of milk is worth from 6½d. to 8d., and even much more, in a period of scarcity, if sold wholesale as fresh milk for household consumption. Of course, the cost of handling and marketing the latter is somewhat greater, and the principal features which tend to vary the cost of producing these two lines of dairy produce may here be briefly commented on. The milk seller must cool his milk carefully and deliver it daily, whereas the cream or butter seller has only to get his produce to the railway station twice in each week. The former is also not able to improve his land as cheaply by manuring as is the man who utilizes his skim milk in the raising of pigs or calves. Allowing, however, for these disadvantages there still remain several factors, other than the difference in actual cash returns, which are almost sure to obtrude themselves speedily under the milk suppliers notice to his ultimate profit. More often than not the necessity for reaching the railway station with the milk at a fixed hour daily will introduce a regularity into the daily work of the farm which it would otherwise be difficult to obtain; and the result is beneficial in many ways. Special attention also must be given to improving the standard of the herd in the way of

persistency and consistency of milking; for cows that will give a regular supply of milk over a long period are particularly valuable for this work. If the supply of milk is to be sustained with a regularity that will be satisfactory to both buyer and seller, it is further necessary that the cultivation methods of the farm be systematic; while the area cultivated must be sufficiently extensive to insure a supply of succulent fodder for the milkers throughout the whole year. With these items provided for, and in a suitable locality, the wholesale milk supply business can be made much the more profitable of the two branches of dairying.

In the Shire of Lilydale one of those who have changed from buttermaking to this wholesale milk supply business is Mr. G. L. Fiedler, of Dorset-road, Croydon. This farm of 120 acres has been rented by Mr. Fiedler for several years past, and on it he now keeps 29 head of milking cows and a few young stock. Twenty-three acres are cultivated for oats, maize, peas, rye, and a little market garden produce. A fairly regular supply of green feed is obtained throughout the year by monthly sowings of such of the above crops as are suitable to the season. Having previously been more extensively engaged in market garden work on this place before his dairying operations developed to their present extent, Mr. Fiedler has a good knowledge of the cultivation necessary to sustain the requisite fodder supply. This, in some measure, counterbalances the drawback which must necessarily arise from the absence of a silo on the farm.

When the first inspection of dairy farms in the Lilydale Shire under the Dairy Supervision Act was made in 1906 this dairyman's name was mentioned among those whose stock were giving the best returns in cream or butter. At the close of that year the seventeen cows on this farm were making 114 lbs. of butter per week. Since then, progressive methods have been suggested and adopted, the herd has been increased to 29 head as stated, and during the year just past the herd has given an approximate average of 540 gallons of milk per cow. In February of the present year 23 cows (including heifers) were giving 50 gallons daily. A recent test of the herd over 24 hours showed 5 per cent. butter fat on the total milk yield, which works out at about 8¾ lbs. of butter per cow, or a good advancement on the 1906 production. However, the sale of the produce from this herd, even at the high butter-fat average stated, is as a direct return, far more profitable when disposed of as fresh milk than it would be if separated for the manufacture of butter.

The heifer calves from the best cows are raised each year; and any surplus stock find a ready local sale. Two photographs of the cows are shown herewith. From these it may be seen that they are a fair grade of Jerseys. All the cows are well cared for, being rugged in cold weather, and stall fed at each milking. At the date of inspection they were being given chaffed hay and maize with about 4 lbs. of bran each daily. They are a useful looking lot of cattle, with extra good udder and milk-vein development, fairly low set, well bodied, bright looking, and very quiet—typical dairy stock throughout. The old cow at the right of the group of six is "Beauty," a 15-year old "dairy queen." She calved in November last, and is now, four months after calving, giving 15 quarts daily. The one in front of her is "Daisy," now calved ten weeks and giving 18 quarts daily. This cow milks well right up to her calving. These two cows and "Dolly," the springer in the front of the group, are three of the six cows that composed Mr. Fiedler's herd in 1903. In January and February of that year, his six cows made 75 lbs. of butter per week between them. By breeding these cows to pure Jersey bulls, his present profitable herd was built up.

Another dairy farm in the same district, which, though on a still smaller scale, presents several points of interest, is that of Mr. R. A. Cummings, Kilsyth. This is a 40-acre block near the Canterbury-road, in about the centre of that low-lying country which extends from the Dandenong Creek at Bayswater to the foot of Mount Dandenong; and which is still largely in its unimproved state. There was a thick bush growth of timber, scrub, and wire grass on this land when it was acquired by its present owner some fifteen years ago. It is a cold heavy grey soil over rotten stone with a clay subsoil.

The natural vegetation here is of no use for milk production, and the low price of the land was the only inducement it then offered to settlement. The last 5 acres of the block was brought under cultivation about eighteen months ago; and a profitable farm is now the result of that fifteen years' work.

AWAITING EVENING MILKING.

As the land was gradually cleared, fruit trees were planted in the irst few acres, and vegetables were grown for market. The taking ip of dairying work was the outcome of the necessity for providing iumus to improve the land. The ground was found to improve rapidly, oth in texture and productiveness, by the use of farm yard manure. The distance from the city placed the obtaining of the necessary quanity of stable manure beyond consideration. The idea of keeping dairy ows, and thus getting a double return from them by using the manure o improve the soil, was therefore put into practice.

The purchase of a cow for the production of the household milk and utter is one of the most important events in the early history of each nall farm. Very few settlers, however, make full use of their farm nimals, for they allow the bulk of the farm-yard manure to waste. A ery conservative estimate of this product suggests that fully £2 worth f manure per cow is allowed to waste on many farms each year through ant of thought. The careful use of this farm manure has been a eat aid to the success of many small farms in this district; but in e majority of cases much of it is allowed to accumulate on camping ounds, and adjacent to slip-rails and such places to leach and wash ray with every rainfall, instead of being carefully gathered and used r the improvement of the soil.

Housing of the cows at night was practised on Mr. Cummings' farm om the first; and the manure and shed drainage were carefully colcted to be used as required. As the land was gradually cleared and

brought under cultivation, more fodder and surplus market vegetables were produced; and the stock were increased accordingly and handled on the profitable lines that had been followed from the start. Mrs. Cummings had charge of the dairy work, and the accounts were kept methodically. The direct monetary result of the dairying was thus always under observation. It was consistently satisfactory, for the stock were well fed. This is another item in farm management that is too often overlooked by the small settler. Frequently, more cows are kept than can be supplied with sufficient food from the area cultivated. The result is ill-fed cows and poor returns. One well-fed cow will give a better return than will be obtained from three others that are kept on short rations; and it is much easier to milk and look after one cow than three. Usually a settler's first cow is well cared for, and she gives a good return for her keep. Too often, however, the stock are increased without allowing for a corresponding increase in the available fodder; and the result is that all are poorly fed and none are profitable. On the farm referred to, however, every cow is as well fed and well cared for as the first was; and the profits from them have been equally sustained.

The 40 acres are now subdivided into nine paddocks, and ten cows are kept. As the land came more under cultivation and the dairying work extended, the growing of fruit and vegetables for market was reduced. The bulk of the fruit trees have now been gradually removed to make room for fodder crops. In the rotation of cropping, two or more paddocks are usually down in grass. These are top dressed with 2 cwts. of superphosphate per acre per year till again broken up. Besides the farm manure, bone dust is also used in cultivation; and the land kept in good heart. Oats, maize, peas, and turnips are the principal crops grown.

The cows are purchased stock, of fairly even medium size, but of mixed breeding. From July, 1907, to June, 1908, inclusive, the returns in cream from the ten cows amounted to £115 9s. 10d.—an average of £11 11s. per cow. The milk is now being sent daily to one of the Melbourne suburbs, the yield being 20 gallons per day.

Water has been found at various depths over most of this district, but the quality varies. In different parts of his farm, Mr. Cummings has obtained both fresh and brackish supplies, more than sufficient for stock purposes.

On a 10-acre block in this vicinity the owner, Mr. Helwig, after sinking 30 feet came on a fine supply of good water that rose 9 feet in the well. He erected a windmill and is using the water for irrigation. By leasing a 50-acre block for grazing, and increasing his cows from two to eight head, he is now also assisting in the city milk trade. From the several small farms that are in a similar state of dairy-farm development here, it is evident that the value of the dairy cow on small holdings is gradually becoming recognised.

MAIZE CULTIVATION.

A Good Crop of "Eclipse."

Mr. A. T. Foristal of Hill Grove Farm, Bena, furnishes the following particulars regarding his maize plot, a photograph of which is reproduced:—

"The seed used was 'Eclipse,' which I obtained last year from the Department of Agriculture. It was sown on 31st October in drills 2 ft. 6 in. apart, and the land was horse-hoed when crop was about 1 foot high.

No manure was used, and the weather has been very dry. Cobbing commenced about middle of January; the cobs are now (22nd March) fully 12 inches long, and are perfect and numerous. Average height of plants is 10 ft. 6 in."

Growing Crop on Battery Sand.

In a recent letter to the Department, Mr. W. C. Kidd of California Gully mentioned that he had grown a splendid crop of maize on battery sand. With a view to obtaining further particulars, Mr. George Henderson, Dairy Supervisor, was deputed by the Chief Veterinary Officer, Mr. S. S. Cameron, M.R.C.V.S., to inspect the plot.

Mr. Henderson writes as follows:—"I have to report having inspected the plot of maize of Mr. W. C. Kidd of California Gully on the 27th March. The land on which the maize is growing has been covered with battery sand to a depth of 21 inches. Stable manure at the rate of 10 tons per acre was spread over land and ploughed in to a depth of 9 inches. The seed was sown broadcast and harrowed in after ploughing. A further top-dressing of stable manure was then applied at the rate of 2 tons per acre. Four bushels of seed per acre were sown and consequently the stalks are very fine and inclined to lie down in places. Although not sown until the 2nd January, the crop is a very heavy one, averaging 8 feet in height. It is now out in flower and is being fed to two cows and three

horses without being chaffed. The crop was irrigated weekly by water from the main, water being distributed by rubber hose with nozzle.

This is Mr. Kidd's first attempt at growing maize for fodder and he is naturally pleased with his success, especially as sand from the deep mines was always looked upon as being barren and worthless. I advised Mr. Kidd to try sowing in drills 3 feet apart next season and to use half a bushel of seed per acre instead of four bushels."

Best Varieties for the North-East.

Mr. G. Mahy, of Leneva, *via* Wodonga, writes—"Of the ten varieties of maize I received from the Department, two are worthy of mention, viz., Hildreth's Yellow Dent and Boone County Special. Both are enormous grain producers, but Hildreth's Yellow Dent has the advantage of being much more drought resistant. Although the past summer was dry, the latter was 11 feet high and yielded 70 bushels of grain per acre. It was grown on old cultivation land without manure and irrigation.

I have experimented with over twenty of the best known varieties and I can say that, for fodder crops and grain in the north-east, there is no maize to equal Hildreth's Yellow Dent. I trust that the merits of this variety will be made known to dairymen and maize growers, as most of them still try to grow the old out-of-date sorts with the result that generally their crops are failures."

YIELD OF RECONSTITUTED VINEYARD AT THE VITICULTURAL COLLEGE, RUTHERGLEN.

G. H. Adcock, F.L.S., Principal.

Owing to the ravages of phylloxera in several of the viticultural areas of our State, the question of the reconstitution of vineyards is a most important one. At the present time many of the smaller growers are hesitating to re-plant on account of the widely-spread but erroneous opinions regarding the utility of these stocks in resisting the effects of phylloxera, and also with regard to the probable yield of grapes, and the character of the resulting wine. As an ounce of practice is worth a pound of theory it has been deemed advisable to give the actual results obtained during the recent vintage at the College vineyard.

To show the value of reconstitution on the American resistant stocks, somewhat extensive experiments have been carried out. Some years ago, under the direction of the writer, selections of the more important wine, table, and drying varieties were grafted on each of the stocks then known in Victoria. The results were very interesting and instructive. Just before vintage the vines in these plots were critically examined by Mr. H. Wilkinson, foreman at the College, Mr. H. Snook, nurseryman, and myself. We assessed the value of each variety individually. When, on comparing notes, we found that our verdict, arrived at independently, was not unanimous, we most carefully determined on points, the value of the particular stock in question. This plot has been most educational, and has elicited the highest praise from visitors from our own and other States, including men whose practical experience entitles them to speak with authority on viticultural subjects.

Besides these tests a commencement was made to re-establish the vineyard. On the very site where vines destroyed by, or dying with, the pest

had stood, grafted rootlings were planted. The ground had no rest. The re-planted portion was surrounded by infected vines. The soil can, by no stretch of imagination, be considered good, but is typical of thousands of acres in this and other districts. Here, too, as in the smaller experimental plots already mentioned, different stocks were used, so that interested visitors might have a practical illustration of the behaviour of the stocks in soil characteristic of the poorer kind of the locality.

The first plantation was of Shiraz in 1903. The subsoiling of this block was not done as thoroughly as in later plantations. During 1905, the vineyard was unfortunately allowed to become over-run with weeds, and the vines were almost smothered. The present season, too, has been an unfortunate one for the vigneron. Owing to the absence of rain for so long and at so critical a period for the crop, the grapes did not fill out, and diminished yields are unfortunately the rule. The College vineyard is planted near a belt of timber which is outside the estate. This affords harbor to large flocks of birds. The vines are also in a corner formed by the intersection of two roads along which there is considerable traffic. Hence the crop was considerably reduced by the depredations of birds, and the peculations of boys and others. The great difference in the yields exhibited in the accompanying table cannot be all attributed to the stocks themselves, but is accounted for largely by the losses already referred to.

It should be noted that the reconstituted portion of the College vineyard is planted 10 x 8 and the vines are trellised on two wires. Rod and spur pruning is the system adopted.

Cabernet is noted as a shy bearer. Those who saw the crop on the College block of this variety were greatly astonished at the yield. A few Merlot had become mixed in this block at planting. The soil of this plantation has been considerably improved by cultivation, green manuring and fertilizing. In the opinion of practical vignerons, particularly from other States, this block is a valuable object lesson. A noticeable and rapid improvement in these vines followed the ploughing in of a vigorous crop of peas for green manuring. The value of this practice has been often insisted on, but, though its utility cannot be over-estimated, it has not received the attention it merits. The presence of moisture in such large quantity in the crop made itself felt when it was turned in, and was as good as a watering. This is a point often overlooked when speaking of the value of green manuring.

In the accompanying table, values have been computed at £5 per ton for the grapes—a price that can readily be obtained locally.

Mr. Wyatt has supplied me with particulars regarding the estimated yields from grafted vines in various parts of this district. Here, too, the season caused reduced yields, and in some of the vineyards the effects of late spring frosts were disastrous.

Messrs. Campbell and Sons obtained about 800 gallons from an area of 5 acres planted in 1903. Mr. C. Nash, whose plot of 4 acres was planted partly in 1904 and the rest in 1906, has 260 gallons. Messrs. ...uhe Bros. obtained 260 gallons from rather more than 2 acres established in 1906. At Fairfield (Messrs. G. F. Morris and Sons), the yield was ...00 gallons from about 7 acres planted in 1906. Mr. T. Brierley, whose vineyard suffered severely from frosts, secured 1,500 gallons from 10 acres that were planted in 1904 and 1905. Mr. Geo. Chandler field-grafted ... acres in 1907 and obtained this vintage 60 gallons from the vines which were only about eighteen months old. Messrs. Schlue and Sons planted Chasselas in 1906 and have disposed of 20 cases of fruit to the acre this

season. Mr. J. L. Stanton from 5 acres, grafted 1904 and 1905, obtained 800 gallons. At the Mt. Ophir vineyard (Messrs. P. B. Burgoyne & Co. Ltd.), an area of 17 acres has been reconstituted. These were planted in 1905 and have received thorough attention in the way of cultivation, fertilizing and green manuring. Mr. T. Ray, the manager, estimates the yield this vintage at 2,300 gallons. These are all in the Rutherglen district. Mr. T. Darveniza of Mooroopna secured the prize offered by the Viticultural Society this year for wine made from grapes grown on grafted resistant stocks. From these and other data that might be given it will be seen that the outlook for reconstitution is distinctly hopeful.

YIELD OF RECONSTITUTED VINEYARD AT VITICULTURAL COLLEGE, VINTAGE 1909.

Planted.	Variety.	Resistant Stock.	Noo Vines.	Net Yield.	Average Yield per Vine.	Yield per Acre.				Value of Crop per acre at local rates.		
				lbs.	lbs.	tons.	cwt.	qr.	lbs.	£	s.	d.
1903	Shiraz	*Hybrid, No. 3,306* . .	38	356	9.36	2	5	2	0	11	7	6
,,	,,	Rupestris meta lica (Cape) ..	684	5,040	7.36	1	15	3	4	8	18	11
,,	,,	Hybrid, No. 3,309	38	266	7.00	1	14	0	0	8	10	0
,,	,,	Aramon x Rupestris Ganzin, No 1	38	227	5.97	1	9	0	1	7	5	0
,,	,,	*Rupestris du Lot*	76	405	5.32	1	5	3	14	6	9	4
1904	Burgundy	Riparia grand glabre ..	190	996	5.24	1	6	1	23	6	7	3
,,	,,	Hybrid, No. 3,309	38	169	4.44	1	1	2	11	5	7	11
1904	Malbec	Aramon x Rupestris Ganzin, No. 1	63	603	8.86	2	3	0	8	10	15	4
,,	,,	Riparia grand glabre.. ..	176	1,408	8.00	1	18	3	12	9	14	3
,,	,,	Hybrid, No. 3,309	478	3,591	7.51		16	1	26	9	2	5
,,	,,	Rupestris metallica (Cape) ..	100	750	7.50	1	16	1	20	9	2	1
,,	,,	Hybrid, No. 101[14]	112	343	3.06	0	14	3	14	3	14	4
1904	Cabernet	Hybrid. No. 3,309	24	241	10.04	2	8	3	2	12	3	10
,,	,,	Aramon x Rupestris, Ganzin No. 1	47	463	9.85	2	7	3	10	11	19	2
,,	,,	Rupestris metallica (Cape) ..	23	221	9.60	2	6	2	1	11	12	6
,,	,,	,, ,, (France) ..	84	755	8.98	2	3	2	17	10	18	2
,,	,,	Riparia grand glabre.. ..	294	2,294	7.80	1	17	3	16	9	9	5
,,	,,	*Hybrid, No. 3,306*	23	179	7.78	1	17	3	5	9	9	0
,,	,,	Rupestris Martin	82	489	5.96	1	8	3	24	7	4	9

A RABBIT-PROOF FLOOD GATE.

T. A. J. Smith, Manager, Whitfield Experimental Farm.

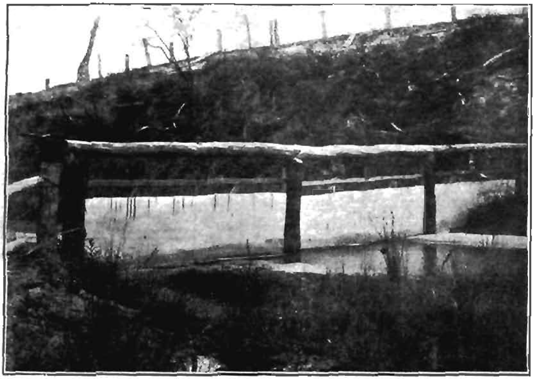
While at Tallangatta recently, I saw the best flood gate I have yet had brought under my notice. It was on the "Fairyknowe" Estate, the property of Mr. A. T. Thompson, who I understand is the originator of the idea. Flood gates often give much trouble in holding *débris*, and are hard to make rabbit proof, but the one under notice has proved a great success and is well worthy of a description in the *Journal* for the benefit of its readers.

The gates are hung from eye bolts, which go through the top beam of the framework of bush timber, and can be either raised or lowered, by tightening or slackening the nuts on the top of the beam as desired. Ground sills, level with the bed of the creek, are necessary to make the gates rabbit proof, and these should be squared on the upper surface.

The frame of the gate is made of 3-inch x 1-inch battens, and on these, plain galvanized sheet iron, 3 feet 6 inches wide, is nailed, on the side facing the stream. This presents an absolutely smooth surface to the

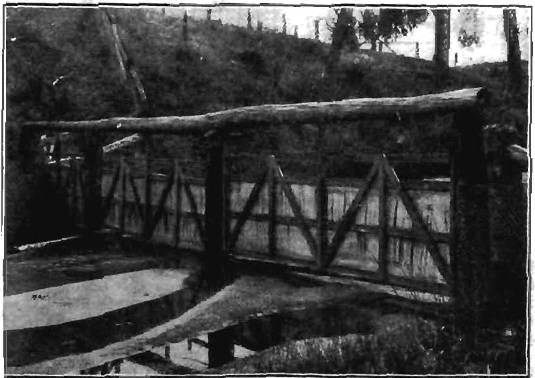
rubbish coming down the creek, and the gate is pushed up as it passes through and escapes down stream.

The span of each gate should not be more than about 12 feet, and the number of gates required will be according to the width of the creek bottom.



UPPER SIDE OF FLOOD GATE.

The photographs show the mode of construction very clearly, the whole being light, cheap, and effective.



LOWER SIDE OF FLOOD GATE.

BOOK-KEEPING FOR FARMERS.

W. McIver, A.I.A.V., A.S.A.A. Eng., Accountant Small Holdings, Crown Lands Department, Melbourne.

The advantages of keeping books of account are so obvious and have been so often explained at length in the various text-books on the subject that it is considered unnecessary to refer to them.

I have endeavoured in this short paper to devise a method which will enable the farmer by as few records as possible, made in a simple way, to ascertain not only the state of his affairs and his profits or losses as a whole but also the profits or losses made on the different branches of his business.

For the purposes of economy in time and labour all unnecessary books have been dispensed with, one book being used for nearly all the records. The arrangement of the accounts, as will be seen from the example, shows that the usual practice has not been followed. A simple extension of the amounts into their proper columns obviates the necessity of keeping a separate ledger and posting the amounts to different accounts therein.

In commencing his records for the year, the farmer should prepare a balance-sheet as shown in Statement "A." This is done by setting out the value of all his assets on the one side and all his liabilities on the other. The excess of assets over liabilities will represent his *capital* or what he is really worth if his estate were realized. This excess or capital is entered on the liabilities side of the balance-sheet making the total of the two sides equal. The balance-sheet is then complete. If, however, his liabilities exceed his assets he has no capital in the business. The *assets* may briefly be described as his property and the *liabilities* as the debts which he has to pay.

"A."—BALANCE-SHEET, 31ST DECEMBER, 1907.

J. FIELD.

Liabilities.

	£	s.	d.	£	s.	d.
Mortgage on Land (*k*) ..		..		100	0	0
Creditors (Revenue) (*e*)	40	0	0			
,, Waggons and Implements (*k*)	6	0	0	46	0	0
Capital		..		1,590	5	6
				£1,736	5	6

Assets.

	£	s.	d.	£	s.	d.
Cash in hand and in Bank		..		50	5	6
Debtors (Revenue) (*h*)	40	0	0			
,, Waggons and Implements	5	0	0	54	0	0
Stock on hand—						
Crops	30	0	0			
Horses	100	0	0			
Cattle	50	0	0			
Sheep	20	0	0			
Pigs	20	0	0			
Poultry	10	0	0			
Miscellaneous ..	2	0	0	232	0	0
Waggons and Implements		..		200	0	0
Land and Improvements		..		1,200	0	0
				£1,736	5	6

If, at the end of the year, the farmer were to re-value all his property and again estimate all his debts, he could by making another balance-sheet in the same way see to what extent his capital had increased or decreased, or in other words, what has been his *profit or loss* on his business as a whole. If the difference between the value of his assets and the amount of his liabilities has increased, he has made a profit corresponding to such increase, but if it has decreased he has made a loss corresponding to such decrease. That is, provided he has not withdrawn any money or goods from the business for his private use. If he has done so, then the value

"B."

CASH—DR. LEDGER ACCOUNTS—CR.

rticulars.	1	Crops. 2	Horses. 3	Cattle. 4	Sheep. 5	Pigs. 6	Poultry. 7	Dairy. 8	Miscellaneous. 9	Waggons and Implements. 10	Land and Improvements. 11	Capital. 12
	£ s. d.	£ s	£	£ s	£	£ s.	£ s.	£ s.	£ s.	£ s.	£	£ s. d.
lances— s per Balance-sheet	..	..	..	..	..	..	..	..	..	..	..	q1,590 5 6
at this date ..	..	15 0	25	..	..	..	..	..	..	k 6 0	k 100	..
and and at Bank a	50 5 6	..	..	..	..	..	..	..	..	..	..	..
ots —b												
ld in market ..	7 0 0	..	..	..	..	7 0	..	..	..	..	..	..
—120 lbs. honey, er lb. ..	1 10 0	..	..	..	..	..	..	..	1 10	..	..	..
son—1 calf, twelve old	1 10 0	..	..	1 10	..	..	..	..	..	..	..	.
—20 pairs fowls, er pair ..	6 0 0	.	..	..	..	..	6 0	..	..	..	..	.
and Co.—25 bush. at 4s. per bush	5 0 0	5 0	..	..	..	..	..	..	..	-	.	..
t—1 cow ..	6 10 0	.	..	6 10	..	.	..	..	..	..	..	..
n—2 tons lucerne £3	6 0 0	6 0	..	..	..	.		..	..	..	..	..
sold in market each	20 0 0	..	..	..	20	..	..		..	..	..	
ld to factory s)	5 0 0	..	..	..	..	..	..	5 0	..	.	.	..
ws—1 colt, two ld	15 0 0	..	15	..	..	..	..	.	..	..	..	..
gs, sold in market er doz. ..	0 15 0	..	..	..	..	..	0 15	..	..	..	..	..
—2 tons lucerne £3 10s. ..	7 0 0	7 0	..	..	..	..	..	..	..	..	.	.
to factory (1 week)	3 0 0	..	..	..	..	.		3 0	..	..	..	..
-30 lbs. butter, at lb.	1 10 0	..	..	..	..	.	..	1 10	..	.	..	..
eod—1 draught	30 0 0	..	30	..	..		.	.	..	..	..	..
ooks,—old plough rrows	12 10 0	.	..	..	..	..	..	.	..	l 12 10	..	..
otals	178 10 6	33 0	70	8 0	20	7 0	6 15	9 10	1 10	18 10	100	1,590 5 6
ries—g												
duce consumed in	..	..	..	..	2	2 5	9 10	1 15	..	..	..	..
duce consumed by	..	3 5	..	..	..	..	..	..	..	..	..	..
hand at this date l down) ..	..	40 0	80	56 0	3	20 0	12 0	..	0 10	.	..	..
&c., land and ements (carried	..	..	..	..	..	..	..	..	..	m 209 0	1,226	..
this date (carried	..	23 0	15	14 0	..	..	..	..	..	5 0	..	..
.. .. £ s. 9 5	..	..	..	u8 10	..	..	..	..	0u15	..	..	..
ation on on, &c., to ded to losses 2 10	..	..	..	..	..	..	..	..	..	2 10	..	..
net profit 52 8	..	..	..	..	..	..	..	..	..	..	..	r 52 8 0
64 3	178 10 6	99 5	165	86 10	25	29 5	19 5	11 5	2 15	235 0	1,326	1,642 13 6
ght down) ..	..	..	..	..	..	..	..	..	..	..	..	1,625 18 0
his date (brought	..	15 0	..	..	..	..	..	..	..	24 0	100	..
and at Bank ..	61 8 0	..	..	..	..	..	..	..	..	..	..	..
—												

CASH—Cr. LEDGER ACCOUNTS—Dr.

Particulars.		13	Crops. 14	Horses. 15	Cattle. 16	Sheep. 17	Pigs. 18	Poultry. 19	Dairy. 20	Miscellaneous. 21	Waggons and Implements. 22	Land and Improvements. 23	Capital. 24
		£ s. d.	£ s.	£ s.	£ s.	£	£ s.	£ s.	£ s.	£ s.	£	£	£ s. d.
Opening Balances —													
Debtors at this date ..		..	h 13 0	15 10	20 10	..	..	..	..	..	n 5	..	..
Stock on hand at this date		..	h 30 0	100 0	50 0	20	20 0	10 0	..	2 0	..	..	..
Waggons, &c., land and improvements ..		.	..	..	..	..	..	..	..	..	n 200	1,200	..
Cash payments—c													
H. Smith—2 tons manure, at £4		8 0 0	i 8 0	.	..	.	..	..	..	..		..	..
H. Drew—5 bush. seed barley, at 4s. per bush. ..		1 0 0	1 0	.	.		..	..	.	..	..	..	.
Thomas and Co.—groceries (private)		5 0 0	.	..	..	..	..	..	..	..	.	..	s 5 0 0
H. Summers—draught horse		25 0 0	.	25 0	..	..	..	..	.	..	.	..	..
M. McKenzie—2 heifers, at £2 each		4 0 0	..	..	4 0	..	..	..	..	..	..	..	..
J. Duncan—6 young pigs		3 0 0	..	..	..	..	3 0	..	..	..	.	..	..
J. Williams—S.F. plough		6 0 0	..	..	..	..	..	..	..	..	o 6	..	..
S. Joseph—butcher's account (private) ..		2 0 0		..	..	.	..	..		..	.	.	s 2 0 0
P. Roberts—1 dozen eggs (white leghorns) ..		1 0 0	.	..		..	..	1 0	..	..	..	..	..
F. Smith—fowl feed ..		2 0 0	..	..	.	.	..	2 0	..	..		..	..
E. Martin—3 hives for bees		0 15 0	..	..	.	.	..	..	.	0 15	..	..	..
Wages paid for cutting lucerne crop		2 2 0	2 2	..	.	..	..	..	..	..	..	..	..
Interest on mortgage on farm		5 0 0	2 0	0 10	1 0	1	0 5	0 5	..	..	.	..	..
Crown rents (part purchase money)		10 0 0	.	..	.	..	..	..	..	..	..	10	..
New stable erected ..		16 0 0	..	..	..	..	..	..	..	..	..	16	..
6 calves bought at market		9 0 0	..	..	9 0	..	..	..	..	..	..	..	..
J. Black—seed potatoes ..		2 0 0	2 0	..	..	..	..	..	..	..	..	..	..
J. Duncan—2 pigs at £1 each		2 0 0	..	..	..	..	2 0	..	..	..	..	..	..
Blacksmith's account to date		10 0 0	5 0	5 0	..	..	..	..	..	..	..	..	..
Sundry private expenses for month		3 5 6	..	..	..	..	..	..	..	..	..	..	s 3 5 6
Totals		117 2 6	63 2	146 0	84 10	21	25 5	13 5	..	2 15	211	1,226	10 5 6
Closing Entries—j													
Farm produce consumed in house		..	..	..	..	..	..	..	..	..	..	..	6 10 0
Farm produce consumed by stock		..	..	..	2 0	..	1 5	..	..	..	..	..	..
Cash in hand and at Bank d (carried down) ..		61 8 0	..	..	..	..	..	..	..	..	..	..	..
Creditors at this date (carried down)		..	15 0	..	..	..	..	..	..	..	p 24	p 100	..
Gains	£ s. 64 3	..	t 21 3	t 19 0	..	t 4	t 2 15	t 6 0	t 11 5	..	.	..	..
Capital account ..	..	..	..	..	..	..	..	..	..	..	..	..	1,625 18 0
	64 3	178 10 6	99 5	165 0	86 10	25 0	29 5	19 5	11 5	2 15	235	1,326	1,642 13 6
Debtors at this date (brought down)		..	23 0	15 0	14 0	..	..	..	..	..	5	..	..
Stock on hand (brought down)		..	40 0	80 0	56 0	3	20 0	12 0	..	0 10	..	..	.
Waggons, &c., land and improvements		..	..	..	..	..	..	..	..	..	200	1,226	..
Cash payments—													

withdrawn must be added to the profit or deducted from the loss, as the case may be, so that the true earnings of the business may be seen.

Though the foregoing is a ready method of ascertaining his profit or loss as a whole, it is not by any means considered sufficient as a guide to the management of the different branches of his business. To assist him he should have a record of his profit or loss on each branch. If he follows out the examples and directions given he will have such a record and will be able to see which branches are paying him and which are not. The number of columns required will depend on the number of branches in the business.

Having completed the balance-sheet ("A"), he should make the opening entries in his book as shown in Statement "B" (pages 306 and 307). The *cash* receipts and payments should be entered in the columns set apart for them and each item extended under its proper head of account.

Column 1 is used to enter the cash on hand or at the bank at the commencement of the period (*a*) and all subsequent cash receipts (*b*), and column 13 to record all the cash payments for the period (*c*) and the cash on hand or at the bank at the end of the period (*d*). (This item is brought down to the next period.)

Columns 2, 3, 4, 5, 6, 7, 8 and 9 are used for entering the opening balances from the liabilities side of the balance-sheet (*e*) and the extension of the cash receipts (*f*), and the closing entries (*g*).

Columns 14, 15, 16, 17, 18, 19, 20 and 21 are used for entering the balances taken from the assets side of the balance-sheet (*h*) (except the cash balance which has already been entered in the cash column 1) (*a*), the extension of the subsequent cash payments (*i*), and the closing entries (*j*).

Columns 10 and 11 are used for entering the opening balances taken from the balance-sheet (*k*) and all subsequent cash receipts for the sale of such items (*l*) and the closing entries (*m*).

Columns 22 and 23 are used for entering the opening balances taken from the balance-sheet (*n*) and all subsequent cash payments for the purchase of such items (*o*) and the closing entries (*p*).

Column 12 is used for the capital at the commencement of the period taken from the balance-sheet (*q*) and the extension of any profit (*r*).

Column 24 is used for entering any withdrawals of capital (*s*) (such as private expenses and the farm produce consumed in the house) and the balance between it and its corresponding column 12. (This balance is brought down in column 12 for the next period.)

Should the balances fall on different sides from those shown in statement "B," the same principle applies and the balances are brought down on different sides.

OPENING AND CLOSING ENTRIES.

Revenue Income and Outlay (crops, horses, cattle, sheep, pigs, poultry, dairy and miscellaneous).—To find the profit or loss on any part of the business it will be necessary to ascertain (1) the total cost of the purchases for the period, (2) the amount of the sales for the period, (3) the value of the stocks at the beginning of the period, (4) the value of the stocks on hand at the end of the period.

As only the cash receipts and payments for the period have been recorded in the accounts, it will be necessary to take into consideration the *Debtors and Creditors* at the beginning and at the end of the period. If this be done the value of the *Sales and Purchases* can be accurately ascertained.

1. To ascertain the amount of the purchases, the creditors at the beginning of the period are deducted (that is, entered in the Cr. columns) and the creditors at the end of the period added (that is, entered in the Dr. columns). The result will be equal to the purchases made.

2. To ascertain the amount of the sales, the debtors at the beginning of the period are deducted (that is, entered in the Dr. column) and the debtors at the end of the period added (that is, entered in the Cr. columns). The result will equal the sales for the period.

3. The *stocks on hand* at the beginning of the period are added to the purchases (that is, entered in the Dr. columns); and (4) the stocks on hand at the end of the period are added to the sales (that is, entered in the Cr. columns). The effect above described in 1, 2, 3 and 4 is produced by the entries made of the opening balances and closing entries as shown in "B."

The difference between the corresponding Dr. and Cr. columns equals the *gross profit or loss* on the particular branch of the business.

Adjustments between departments.—It will be necessary to make some adjustments to ascertain the *net profits or losses.*

Consumption of produce from the farm is equivalent (1) to a sale on the part of the business and (2) to the withdrawal of capital by the farmer. It is therefore entered on both sides (1) on the Cr. side of the items consumed and (2) on the Dr. side of the capital account.

Consumption of farm produce by stock is equivalent (1) to a sale on the part of business represented by crops and (2) a purchase on account of the live stock. No money passes, only a value being fixed for the purposes of adjusting the profits. Crops account is credited and the cattle and pigs account debited.

Depreciation.—Depreciation of the farm implements and plant must be added to the losses, as the wear of the waggons, carts, ploughs and machinery is certainly a loss; therefore the depreciation is entered in the Cr. column of the waggons, &c., account, and then added to the losses as shown in "B."

Net Profit or Net Loss.—The difference between the corresponding Dr. and Cr. columns after making the adjustments and allowing for depreciation will be the *Net Profit or the Net Loss.*

If the sum of the Cr. column is greater than its corresponding Dr. column, the difference is profit and is inserted in the Dr. column to make it balance (*t*). If the sum of the Dr. column is greater than its corresponding Cr. column, the difference is a loss and is inserted in the Cr. column to make it balance (*u*).

Having treated all the revenue columns in the way indicated, the totals of the balances inserted in each side respectively are added in the inner column and the difference between the two inner columns extended in the capital account column, being the net profit (*r*) or net loss. The farmer will now be able to see not only his profit or loss as a whole, but how much of it is contributed by each branch of his business.

Balances Brought Down.—The debtors inserted in the Cr. columns at the end of the period should be brought down in their corresponding Dr. columns on the opposite side as they will also be the debtors at the commencement of the new period.

The creditors inserted in the Dr. columns at the end of the period should be brought down in their corresponding credit columns on the opposite side as they will also be the creditors at the commencement of the new period.

The stocks on hand entered in the Cr. columns at the end of the period are brought down in the corresponding Dr. columns as the stocks on hand at the commencement of the new period.

Capital Income and Outlay (waggons, implements, land and improvements).—*Capital Outlay* may be taken to mean expenditure on the items used for the purposes of working the farm and not bought for the purpose of selling at a profit and *Capital Income* as income from such items if they should at any time be sold. These columns, Nos. 10 and 11 and 22 and 23, after the extensions and the closing entries (including depreciation) have been made are simply balanced by inserting the difference between the corresponding Dr. and Cr., the balances brought down in the proper columns on the opposite side being the book value of these items.

The capital account columns are balanced in the same way by inserting the difference and the balance brought down in the capital account column on the opposite side.

New Balance-Sheet.—Having ascertained the net profit and balanced all the columns for both the revenue and capital items, the new balance-sheet (c) can be prepared from the figures brought down.

"C."—BALANCE-SHEET, 31ST JANUARY, 1908.

J. FIELD.

Liabilities.

	£	s.	d.	£	s.	d.
Mortgage on Land . .				100	0	0
Creditors (Revenue) .	15	0	0			
" Waggons and Implements	24	0	0			
				39	0	0
Capital				1,625	18	0
				£1,764	18	0

Assets.

	£	s.	d.	£	s.	d.
Cash in hand and in Bank ..				61	8	0
Debtors (Revenue) ..	52	0	0			
" Waggons and Implements	5	0	0			
				57	0	0
Stock on hand—						
Crops	40	0	0			
Horses	80	0	0			
Cattle	56	0	0			
Sheep	3	0	0			
Pigs ..	20	0	0			
Poultry .	12	0	0			
Miscellaneous	0	10	0			
				211	10	0
Waggons and Implements ..				209	0	0
Land and Improvements ..				1,226	0	0
				£1,764	18	0

Having obtained his balance-sheet, the farmer knows exactly how he stands and the result of his transactions for the year. He has also the particulars at hand for making up his income tax returns.

GENERAL.

Period means the time between one balance and the next. The balancing and preparation of the balance-sheet should be done at regular intervals. The most suitable interval for a farmer would be a year, probably from the beginning to the end of the calendar year. The period covered in the example is one month.

Withdrawal of Capital from the Business.—It will be noticed that the payments for private expenses are extended to the Dr. of capital account column. This is done to reduce the capital, as any expenditure for private purposes is a withdrawal of capital from the business. The same principle applies to the consumption of produce from the farm, which produce if not consumed would remain in the business or be sold.

Expenditure for Crown Rents and Improvements.—This item has been treated as part purchase and consequently extended to the land and improvements account column to increase the amount. The same principle applies to expenditure for permanent improvements. (Note.—Repairs

would not be so treated. They would be divided amongst the revenue items in the proportion in which the money was expended.)

Interest on Mortgage on Farm.—This expenditure is divided up amongst the revenue items according to the area or value of the land taken up by each particular branch.

Creditors and Debtors.—They may be divided into two classes (1) those which refer to capital items (land, waggons, &c.) and (2) those which refer to revenue items (crops, horses, cattle, &c).

Bills of Exchange.—Bills of exchange or promissory notes are included in the debtors and creditors and are not taken into account as receipts or payments.

Horses.—Although horses are dealt with as a department, the crop consumed by them is not taken into account as it is considered that the work performed by them in putting in and taking off the crop is sufficient repayment for the crop consumed.

Depreciation.—If great care is taken of the implements, &c., the depreciation to be added to the losses each year need not perhaps be more than 10 per cent. on the diminishing value, but if only ordinary care is taken of them probably 15 per cent. will not be too much. Depreciation will depend also to some extent on the nature of the machinery, &c., as to whether they are likely to be superseded in the market by later and more up-to-date articles.

"D."

(Credit transactions only to be entered in this Book.)

DEBTORS.	Date of Payment.	£ s. d.	CREDITORS.	Date of Payment.	£ s. d.
List of Debtors on 31st December, 1907.			*List of Creditors on 31st December, 1907.*		
J. Cameron—2 tons lucerne hay at £3 per ton—sold on 18th November, 1907 ..	17.1.8	6 0 0	B. Brooks—60 bushels seed wheat at 5s.—bought 1st September, 1907	5.1.8	15 0 0
G. Brown—2 tons lucerne hay at £3 10s.—sold on 24th October, 1907..	30.1.8	7 0 0	H. Summers—1 draught horse—bought 28th November, 1907 ..	..	25 0 0
B. Drew—1 light horse—sold on 31st October, 1907 ..		15 10 0	J. Williams—1 S.F. plough—bought 1st November, 1907 ..	9.1.8	6 0 0
E. Gilbert—1 cow—sold 15th November, 1907	13.1.8	6 10 0			46 0 0
B. Roberts—2 fat steers at £7 each—sold 18th November, 1907..		14 0 0	*20th January, 1908.*		
F. James—1 light cart—sold 1st October, 1907		5 0 0	Victorian Implement Co.—1 cultivator		24 0 0
		54 0 0			
8th January, 1908.					
W. Robertson—6 tons lucerne hay at £3 per ton		18 0 0			
28th January, 1908.					
J. Smith—2 pigs at £2 10s. each ..		5 0 0			

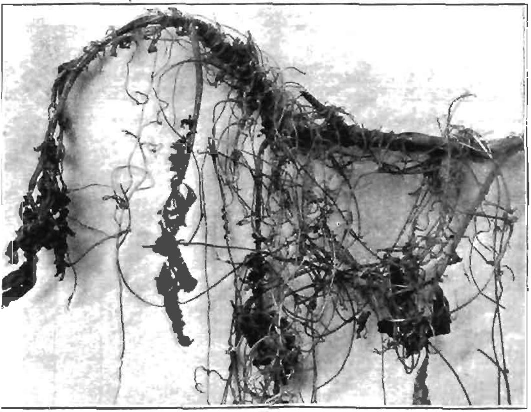
Wages.—The wages of the farm hands should be divided up and charged to the different branches according to the time given to each branch.

General.—The increase or decrease in the value of the farm and the interest which could be earned by the capital invested in the land, if placed in the bank on deposit or otherwise invested, as well as the salary of the farmer for acting as farm manager, and the value of the assistance given by his wife and family, are all matters which he must consider in connection with his profits if he wishes to know whether farming pays him; but his own judgment will determine the services which he should bring into the account.

Memorandum Book.—For the purpose of ascertaining the debtors and creditors at the time of balancing, it will be necessary to keep a small book in which to enter all the sales and purchases for *Credit.* These entries should be marked off when payments are made. Those entries remaining unmarked will represent the debtors and creditors as the case may be. See Statement "D." Most farmers buy and sell principally for cash so that the entries in the Memorandum Book will be very few.

DODDER INFESTED POTATO PLANTS.

Whilst judging a maize crop competition in the Trafalgar district, Mr. . M. B. Connor observed that potatoes, cow grass and hog weed growing in different parts of the Moe Swamp were infested with dodder. Some



POTATO PLANT COVERED WITH DODDER.

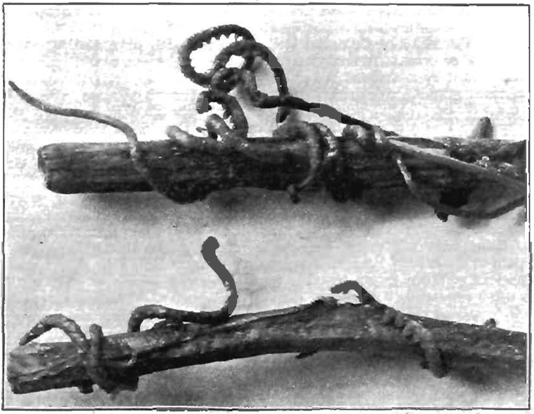
of the specimens secured by Mr. Connor were photographed, and are here reproduced so that farmers and others may keep a keen look-out for the pest and immediately eradicate it should it appear on their holdings. Neglect to take prompt action will inevitably mean that the growing value

Recognising the importance of the discovery, the Chief Veterinary Officer, Mr. S. S. Cameron, M.R.C.V.S., forwarded the specimens and the following letter to Professor Ewart, Government Botanist:—" One of my supervisors (Mr. Connor) the other day came across a patch of potatoes heavily infested with dodder. The incident has created a considerable amount of interest amongst officers of the Department, and I would be glad if you would examine the sample sent along with a view of classifying the dodder.

Last year, at Geelong, one of the supervisors (Mr. G. Harmer) found weeds such as Cape Weed and Dandelion, badly infested, and it appears to me of importance to know whether this is the variety of dodder that has hitherto been supposed to attack leguminous plants only, or another variety which is apparently cosmopolitan in its tastes."

Professor Ewart has replied as follows:—" The specimen of dodder forwarded is *Cuscuta epithymum* L. European dodder. It is not usual to find it on the potato, but this species and also *Cuscuta europæa* L. will grow upon almost any herbaceous stem. The effect on potatoes is as bad as upon lucerne or clover. Immediate eradication, burning all refuse, is desirable.

Dodders are not confined to *Leguminosæ*, although one variety, clover dodder, "*C. trifolii*," usually grows only on clover; another, flax dodder, *C. epilinum*, usually only on flax. The general preference of dodders for



STEM OF POTATO PLANT WITH DODDER ATTACHED (ENLARGED).

Leguminosæ results from the fact that these plants readily provide the nitrogenous food which dodders especially need.

C. epithymum is proclaimed for the whole State. *C. europæa* has not hitherto appeared in this State, although large quantities of seed of the other European dodder are imported annually."

CATALUÑA.

(Continued from page 271.)

F. de Castella, Government Viticulturist.

PRIORATO WINES AND THE RANCIO TASTE.

These words have already been used once or twice; before proceeding to describe the wine-cellars I visited it will be well to explain their exact meaning. *Priorato* is really the name of a small district in the province of Tarragona which has long been celebrated for the wines it produced; so much so that its name has come to represent a type of wine with a distinct character of its own, known both in Spain and France as *Rancio*. This special flavour is rather difficult to define. It reminds one, at the same time, both of Port and of Madeira though distinct from either. Muscat wines, which through age have lost most of their muscat character and have become nutty, usually possess a distinct Rancio tendency. Certain wines of high alcoholic strength develop this character very readily and in several parts of Cataluña they have long been known and appreciated. The development of this special flavour is accompanied by a marked change of colour; this lightens considerably and at the same time becomes tawny. The exact nature of this transformation has not been thoroughly studied; it appears to be mainly an oxidation process, for it takes place more readily in wood than in bottle. The two principal factors which contribute to its development are the variety of wine grown and the type of soil; if both are suitable, it develops very readily.

The Garnacho or Grenache is the variety which most easily produces this type of wine. When young, it has a bright red colour, similar to that yielded by most other red grapes. With age, especially if made from overripe grapes, this changes, gradually becoming more and more "tawny" or "onion peel colour" as it is described in French; very frequently and especially if the soil on which the grapes were grown was of the required type the Rancio taste develops at the same time. Instability of colour, which in the case of an ordinary dry wine is one of the chief defects of the Grenache, becomes in this special case an advantage. The influence of soil is very striking. If this be of the right type, viz. a stony hillside of Primary slate or schist, the Rancio taste is almost certain to accompany the change of colour, which is less stable than when grown on limey soils. Though Grenache is largely grown throughout northern Spain and southern France, it is only on Primary soils that this character develops. When grown in other formations, a red wine of good quality is often produced, but without distinctive character. The more stony the soil, provided the geological formation be of the right kind, the more pronounced is the development of the Rancio flavour and in the *pizzaras* (slates) of the Priorato district, and some other parts of Cataluña, it is particularly pronounced.

Only in wines of fairly high alcoholic strength—over 25 per cent. of proof spirit—is this transformation advantageous; in lighter wines it is a defect, and in the case of wines of a claret type its occurrence, even in a slight degree, is an accident to be avoided.

It is these Rancio wines which form the basis of what is so largely shipped to England under the name of Tarragona Port at the present day. The development of Rancio flavour belongs to the same class of changes as that of the Port character in the celebrated wines of the Alto Douro in

district is also of Primary age. The varieties of wine grown are, however, quite different in the two cases, the Garnacho of the Priorato not being cultivated in the Alto Douro. Whether the true Port varieties, introduced on the schistose hillsides of Cataluña, would produce wine more similar to that of the Alto Douro has not been tried; it is at any rate quite possible.

Tarragona Ports, however, are not the only Rancio wines exported. This class also forms the basis of many of the wines shipped to South America, though in this case they are, as a rule, unfortified and almost dry.

The Priorato type of 30 or 40 years ago is now a thing of the past, but it has given rise to two distinct wines of which it constitutes the basis, viz.: a stronger and sweeter wine for shipment to England and a lighter and drier wine which has South America for its destination.

To Victorians, Rancio wines should prove decidedly interesting, seeing that large areas in our State consist of poor stony hillsides of Primary formation very similar to those which yield Ports and Rancios in Portugal and North-eastern Spain. I have, in Rutherglen and elsewhere, seen wines grown on soils of this description with a distinctly Rancio tendency, though made from varieties, such as the Shiraz, which are not specially suited for the development of this character. The Grenache and the true Port varieties would in all probability, under similar circumstances, have produced Rancios and wines of Port type of far higher commercial value.

It should be satisfactory to Australians to remember that wines of high quality are frequently produced on Primary formations. So far as the Peninsula is concerned, we find the Ports of the Alto Douro; the Mountain wine of Malaga, now unfortunately almost extinct; and the Rancios of the Priorato, all of which are grown on formations very largely represented in Victoria.

The Bodegas of Barcelona.

The magnitude of the Barcelona wine trade came as a surprise to me. The statistics quoted above give some idea of it, but it requires a visit to one of the bodegas of the large wine merchants to enable it to be fully realized. Thanks to Don José Gras y Fort, I was able to visit two of these mammoth establishments. That of Don Pedro G. Maristany (pronounced Maristang), Rambla Cataluña 83, is one of the oldest-established houses in Barcelona. This business was formerly well known in South America under the then name of the firm of Pera Grau, the trade mark or brand of which, P.M.G., was equally familiar. A few notes I was able to take during my hurried visit will give some idea of the enormous quantity of wine handled. Don Pedro owns important vineyards of his own which yield annually over 100,000 gallons of wine, but this constitutes only a small portion of the contents of these cellars, for he buys far more wine than he grows.

The first cellar one is shown into is a high well-ventilated building with a heavy tiled roof, such as is usual in Spain. In this, stand two giant storage vats; everything being well proportioned, their enormous size does not at first strike one and it comes rather as a shock to learn that each of these is capable of containing 88,000 gallons of wine. At first I could scarcely credit this, but there could be no doubt about its correctness, 4,000 hectolitres of 22 gallons each are equivalent to 88,000 gallons according to our measures. As these vats were some 25 feet in diameter at the bottom, with staves over 25 feet long, a simple calculation will suffice to approximately check the correctness of the gauge. These giants

are of the usual vat shape, though closed in at the top; the staves, of Norway pine, some 4 inches thick, are held together by hoops more like heavy waggon tyres than those usually driven on vats, for they are of iron about 4 in. x ½ in. Though these are the two largest vats there are many others not very much smaller, so that the total capacity of these enormous cellars expressed in gallons must run well into seven figures. Everything is in proportion and excellently arranged. Earthenware pipes are fitted everywhere, for the handling of the wine, which is forced through them by electric pumps, driven from the ordinary town circuit. One of these pumps, a rotary one, made locally by the Industria Electrica Barcelona, was very neat. Its cylinder was only about 6 inches in diameter and of about the same length, yet it was capable of pumping over 1,200 gallons per hour.

The cement floor falls slightly to a sink, communicating with a large reservoir, to guard against loss in case of accident through the bursting of a storage vat. A large German filter (Gustav Seigel No. 4. size), capable of dealing with 12,000 gallons per day was at work. One of the most striking features of the establishment was the system of artificially ripening wines by exposure to the sun, in large butts known as *Bocoys*. This method, also practised in the south of France, has for its object the hastening of the development of the Rancio taste. The scale on which this sun ripening was being carried out was enormous; no less than 2,000 bocoys of over 140 gallons each were enclosed in a single yard, as well as a considerable number of vats and larger casks. The wines undergoing this ripening process, which lasts sometimes a year or two, were both red and white, though chiefly the former. Red wines are frequently treated in casks of chestnut wood which gives colour to white wine.

The second bodega I visited was that of Don Magin Pladellorens—a remarkable establishment which has attained its present enormous dimensions by gradual additions from a very small start. The owner, as his son was proud to tell me, was not so very many years ago only a working cellar-hand. The stock in these bodegas at the present moment must amount to over a couple of million gallons. One is shown the four original vats containing between them 250 cargas (6,000 gallons) which were the starting point of this vast business.

Here, also, did I find a giant vat capable of containing 750 pipes (nearly 80,000 gallons). It was surrounded by smaller, but nevertheless very large vats, and the floor of the cellar in which they were contained was formed by the stone flagged tops of large underground storage tanks. The vats and tanks in this particular cellar—only a portion of the premises—contained 6,500 pipes or considerably over half-a-million gallons. Here, again, artificial development of the Rancio taste by exposure to the sun is very largely practised. The main yard in which this sun ripening process was being carried out contained 17 large vats and 6,000 pipes. Wine under treatment remains thus exposed for a couple of years, during which time the casks are regularly filled and occasionally racked. The process is thus one of slow oxidation through the pores of the wood, aided, perhaps, by the actinic rays of the sun. It has nothing in common with the direct action of air, in ullaged casks, with or without the presence of *flor* on the surface, which is the most striking feature of sherry maturation.

These sun ripened wines are probably blended afterwards with wines matured in the ordinary way. Their age and loss through evaporation no doubt renders them somewhat expensive, but this is made up for by their

value for blending purposes. They seem to be absolutely necessary for the production of wine of the modern Priorato type required in South America. The strength at which the wines are exposed seems to be about 28 or 29 per cent. (proof) in the case of dry wines and over 30 per cent. for sweet. The majority, however, are dry, it being usual to sweeten them afterwards, if necessary, by the addition of Arrope or Mistela. *Arrope* or boiled must (what we erroneously term Geropega in Australia) was being made in a large tinned copper boiler, heated by a steam coil of the same metal, also tinned. It was being reduced to one-third of its original bulk and was of dark colour and had the usual cooked smell.

Mistela is the Spanish name for what is known as Geropega in Portugal. It is the must of very ripe grapes, the fermentation of which is prevented by fortification. I was informed that though the law permits the use of any rectified spirit, that made from wine is solely used; ample quantities are obtainable and exemption from excise is allowed in the case of wine spirit.

Filters are extensively used, a raised reservoir some 30 feet above the ground providing the necessary pressure. Various types of pumps were shown to me; one of these, driven by a small gas-engine, could handle over 100 gallons per minute. A large pasteuriser of French make appeared to be in constant work. The value of pasteurisation for wines, often more or less fruity but of only medium alcoholic strength, can be easily understood.

Both establishments struck me by the up-to-date nature and general efficiency of everything in them. Each was equipped with a laboratory, such as one would expect to find in a modern brewery rather than in a wine cellar. The sun ripening process was a most interesting feature and one which had not previously come under my notice in Spain. But what struck me more forcibly than anything else was the enormous volume of trade done in these Barcelona bodegas. Don Magin Pladelloren's shipments total 36,000 quarter-casks, or about a million gallons a year, and Señor Maristany's operations are on a similar scale. Nowhere else in Spain did I see anything of the kind. The wine I saw running, literally in rivers, in the stone channels provided for the purpose, reminded one rather of water for irrigation. It was hard to realize that it was really wine. South America is the destination of most of it. The wine is shipped in bulk and bottled and sold on arrival. The average wholesale price would be somewhere about £9 or £10 per pipe of a little over 100 gallons f.o.b. Barcelona.

PRINCIPAL TYPES OF WINE.

The following were the principal types of wines shown to me:—

Priorato de Mesa (table)—the modern type. This was a nice, clean wine of rather light red colour, and an alcoholic strength of 25 to 27 per cent. (proof) with good bouquet, and a distinct, though not very pronounced Rancio character. It was probably a blend of a typical Rancio with a good deal of wines not developing this flavour, for most of the wine handled at Barcelona is grown between that town and Reus, on limestone, and not on schistose soil. The colour was a perfect, bright red, without any trace of purple, but not exactly tawny either. Its specific gravity was that of water (0° Baumé) which would indicate a small percentage of unfermented sugar, probably added in the shape of mistela—just enough to render it fruity but not sweet. This wine would probably be made from Garnacho blended with some other local varieties such as Cariñena and Sumoll.

Malaga Seco.—A white wine of light golden colour, of the same strength as the Priorato de Mesa, and therefore less alcoholic than the wine of Andalucia it is called after; the use of the name of which is, by the way, contrary to Madrid Convention rules. This was a nice, rather neutral wine, not unlike some of our so-called Australian sherries, but less alcoholic and with less distinctive character. Like the previous wine, it is largely sun ripened and slightly sweetened with mistela; its gravity was also 0° Baumé.

These two types constitute the bulk of shipments to South America. It is strange that their alcoholic strength should be so similar to that of our own export wine. The red differs widely from ours, however, in colour and body being paler and thinner.

Priorato Dulce (sweet) a dark red wine with a rather purplish tint, sweeter and more alcoholic than the Priorato de Mesa.

Malaga Dulce.—This is like the Malaga Seco, but sweeter and more alcoholic—a somewhat neutral, clean sweet white.

In addition to these main types, other intermediate ones are made up according to customers' requirements.

In one of the cellar laboratories I was in, there were framed formulæ on the wall for wines of different type to any of the above—wines of which the alcoholic strength would go up to 32 per cent. and even 37 per cent. (proof) with acidities between 2.2 and 2.6 per cent. of sulphuric acid and a sugar strength of about 5 per cent. Such wines used formerly to go extensively to Brazil but that country is now chiefly supplied from Portugal.

I have not yet referred to the Tarragona Ports, so largely shipped to England. These wines, which are handled at Reus and Tarragona and not at Barcelona, can more conveniently be described later.

Such is a brief description of what I was able to see of the Barcelona wine trade. Of the South American shipments, I knew practically nothing, nor do I think its importance is realized in English speaking countries. Victoria is admirably suited for the production of wines of similar type—our schistose hills will, if planted with the right variety of vine, produce Rancios of pronounced type. The area of land suitable for producing this class of wine in France and Spain is limited. The possibility of our finding a market for such wine among our Spanish neighbours across the Pacific is at any rate worth consideration. Perhaps not in Argentina or Chili, where wine production is increasing steadily, but in the more tropical republics of Peru, Ecuador, Bolivia, and Columbia business might be done. These countries are much nearer to us than to Spain.

THE PRIORATO DISTRICT—TARRAGONA PORT.

In the preceding pages the word Priorato has been employed to designate a type of wine. It really is the name of a well defined district in the province of Tarragona.

The railway line from Zaragoza to Barcelona crosses the Ebro at Mora la Nueva after a most interesting though tortuous route on the right bank of that great river, the course of which, about here, is in very rugged country. The picturesque ruins, villages, and churches near Flix and Asco leave a vivid impression on the memory. A couple of stations past Mora, the traveller finds himself in the heart of the Priorato district. Vineyards once more become a feature of the landscape and very picturesque they are, climbing up the hillsides in terraces similar to those of the Alto Douro and the Rhine. They are, however, less numerous than they were some

years ago. The vine industry in these parts suffered most severely from phylloxera which, on these dry hillsides, proved very deadly and where, as at Malaga, early reconstitution failures owing to the use of the Riparia stock deterred many from replanting. Falset, a large village near the Marsa-Falset railway station may be looked upon as the centre of the district, which is roughly a valley running E.N.E. from Mora la Nueva, between the Montes de Garrancha and the Sierra de Prades on the flanks of which the best vineyards are situated. The Ciurana, a small tributary of the Ebro, runs through the valley. After passing the stations of Pradell and Torre de Fontanbella, a tunnel through the Sierra de Prades range, takes one out of the Priorato proper, with its pizarra formations, into limestone soils where the wines produced are of quite a different type to the Priorato Rancios.

Shortly after passing this tunnel Reus is reached, a town of 27,000 inhabitants, which was formerly the headquarters of the old Priorato wine trade and still is the commercial centre of the more recent trade in these wines, which are largely shipped to England under the newer name of Tarragona Port. As has happened in Portugal, the name of the port of shipment has displaced that of the district where the wine is grown.

Falset and the adjoining villages Cornudella, Poboleda, and Porrera produce the choicest Rancio wines. Next to these, so far as quality is concerned, some Gratallops, Masroig, Guiamets, Marsa, and Capsanes where the land is a little less steep and rocky.

The district was divided in old days into Priorato Alto and Priorato Bajo (upper and lower); all the above villages are situated in the former division. Here the Garnacho was the variety exclusively cultivated; a Rancio wine was wanted, and this variety produced it in a more pronounced form than any other in these typical pizarro soils.

Priorato Bajo consisted of the lower portions in the valley where the soil is alluvial and often calcareous. Here, Rancio wines are not produced; other varieties, especially Cariñena (Carignane), are grown as well as Garnacho, yielding wine of more usual type.

The upper division, owing to its special nature, is the one presenting the most interesting features. In many parts there is practically no soil; the vines are grown in the much fissured, slaty, schist in the same way as in the Alto Douro district of Portugal. In pre-phylloxera days, when ungrafted vines could be used, these were planted by sinking a hole in the easily broken rock with a crow-bar. In the most arid situation, where the best wines were grown, this hole was filled with a couple of baskets of soil in which the young vine could find some nourishment until such time as its roots had established themselves in crevices in the rock. It was estimated that it cost 1 peseta per vine to plant a vineyard. With about 1,000 vines per acre the cost of establishment would come to about £40 per acre, even with the cheap labour available. Such conditions are not at all suited for resistant stocks, and one can easily understand the unsatisfactory results obtained when their use was attempted in the same manner as with the ungrafted vinifera, especially with so exacting a stock as regards moisture and richness of soil as the Riparia.

There is a marked difference between the district before and after phylloxera. The tendency has been to replant the richer soils rather than the dry slaty hillsides. Thus it is that the bulk of the trade is now in cheap Tarragona ports, probably blends containing only a proportion of Rancio wine from pizarra soils, such as gave the district its ancient reputation.

There was little to be learnt about reconstitution in the Priorato. The stocks used are Rupestris du Lot and Riparia Gloire. The former seems to give satisfaction in all but the driest situations—wherever the rock is sufficiently fissured for it to be able to get its roots down, and there is, at least, a certain amount of soil. The soil being a poor one, no trouble is experienced so far as non-setting of fruit is concerned. The Riparia stock is confined to rich valley soils where it seems to do fairly well. No doubt, some of the newer hybrids would give good results, but strange to say they do not appear to have been tried.

Wine-making is a simple process, the peculiar character of the wine depending more on soil and variety than on any special treatment. The grapes are gathered when very ripe, crushed, and vatted in the ordinary way. Fermentation is allowed to proceed for a long time on the skins—sometimes for as much as twenty days—after which the wine is racked off and fortified. The spirit is often added before fermentation.

In the Priorato, as is usual throughout Cataluña, the wine is usually made by the grower who sells his young wine to the merchant. Large wineries which buy the grapes are the exception.

REUS.

REUS.

In company with Don José Gras y Fort, I visited this centre on 11th January. It is a small but well-built town, possessing many fine buildings. The leading church, a photograph of which is here reproduced, is characteristic. The town has passed through many vicissitudes, rising or falling with the prosperity of the wine trade on which it so largely depends. It saw bad times some fifty years ago when a crisis occurred in the wine trade. Again, in the eighties, the outbreak of phylloxera did it much injury. Though reconstitution may be looked upon as an accomplished fact, the volume of trade is considerably less than it was formerly.

Thanks to the kindness of my guide, I was able to visit two of the largest wine merchants' establishments in this, his native town.

These were the bodegas of the firm of Mayner y Pla and those of Don Román Perpiñá. They were both fine, up-to-date establishments handling very large quantities of wine. The rule here is for the cosechero or farmer to make his own wine, selling it afterwards to the merchant who blends, matures and exports it. Both the above houses ship largely to England. Mayner y Pla are successors of the older firm of Pablo Oliva y Boule whose trade mark P.O.Y.B. in a circle, has long been well known to the English wine trade.

Pasteurization is very largely practised in both bodegas and no secret is made of the fact. At Mayner y Pla's there was a very large pas-

teurizer of special construction by means of which all wine was pasteurized to 75 deg. C. Don Román Perpiñá uses a "Pastor" pasteurizer—the well known Bordeaux make. An interesting addition to this machine was an air pump by means of which air could be forced into the wine during its passage through the hottest part of the machine in order to artificially develop the Rancio taste. In the case of ordinary dry reds, contact with air at high temperature is carefully avoided. Dry wines are usually treated at 80 deg. C. (176 deg. F.) but for sweet *wines temperatures of up to* 100 deg. C. (212 F.) are preferred. It is remarkable that, once pasteurized at a high temperature, these sweet wines seem to stand shipment, even to Canada, without risk of fermentation though only moderately fortified. Much Tarragona Port is shipped under 30 per cent. of proof spirit.

I tasted several different wines. One of these, a Priorato, though only two years old, was already distinctly tawny in colour and Rancio in taste. An Australian would probably describe it as "becoming porty." I was shown a ten-year old Rancio, a very fine wine which had lost most of its colour. It reminded me somewhat of an old Rutherglen Pedro in taste as well as in colour.

Young wines, on the other hand, were almost as dark as our Shiraz and not unlike it in character. I was also shown some Mistela, very dark and sweet with a gravity of 10 deg. Baumé. This is sometimes shipped to Germany under the name of Geropega. In these Reus bodegas, I again saw some of the huge storage vats similar to those by which I had been so much struck in Barcelona, also pumps &c., proving the scale on which operations are conducted. Sun ripening of wines was, however, less in evidence, the Priorato wines developing more easily the Rancio character, their natural maturation is, no doubt, usually sufficient.

Such is the state of the Priorato district at the present day. The unfortified natural Rancio wines for which it was famous are no longer known as such. Under a modified form and probably largely blended, one portion finds its way to South America whilst another portion, fortified and probably also blended, is shipped to England as Tarragona Port.

VILLAFRANCA DEL PANADÉS.

The Panadés is the name of a district, similar in size to the Priorato but quite different in geological formation and in the wines it produces. The former is mainly Secondary (often Cretaceous) and Tertiary. Its soils are rich in lime, usually containing 25 to 30 per cent. of carbonate. Its wines are mostly vin ordinaire of good quality, both red and white. It is said that a good deal of it finds its way to La Rioja to supplement, by blending, the shortage caused by the ravages of phylloxera in that district. The Panadés has long been reconstituted, mainly on Rupestris du Lot, which is, on the whole, giving satisfaction. Villafranca is a small but prosperous town, depending largely on the wine trade. Casks and cellars are everywhere in evidence. I saw here a curious form of dray, of which a photograph is reproduced. It is very convenient for the handling of butts and pipes, weighing when full, over half a ton each. These casks are swung by chains from the prolongation of the shafts, one fore and one aft of the axle. The chains, manipulated by winches, permit one man to do all the handling of these heavy vessels.

THE ESTACION ENOLOGICA.

This has been mentioned as one of the experimental and educational stations, established under the comparatively recent policy of State aid to viticulture. Another similar station has quite lately been opened at Reus, but was not yet in working order at the time of my visit. The Villafranca station itself, has lately been entirely remodelled and brought up to date, a thoroughly equipped laboratory, capable of accommodating 50 students, being one of the chief additions. Experimental vine plots of all kinds are conducted in connexion with the station, which is under the direction of Don Cristóbal Mestre Artigas who has only recently been appointed to the position. He received me most courteously and I much regretted the unavoidable brevity of my visit. Run on similar lines to the other "Estaciones," I have described, this institution is doing good work. Affinity problems are receiving a good deal of attention. I was informed that the small round muscat of the district does well on 1202, but is less satisfactory on A.R.G.1.

CART FOR HANDLING HEAVY WINE CASKS.

Don Cristobal supplied me with some interesting figures as to gravities, acidities and yields of some of the leading varieties of Cataluña. These observations were made at the Estacion, on grafted vines three years old.

RED VARIETIES.

Variety.	Yield per acre. Tons.	Yield per acre. Cwts.	Gravity—Baumé.	Acidity per 1,000—as Tartaric Acid.
Trepat	5	8	8.2	7.8
Malvasia Roja	5	4	—	6.27
Sumoll	4	12	12.3	8.11
Garnacha Roja	4	2	13.8	5.07
Tempranillo	4	1½	11.4	—
Graciano	2	9	10.0	7.65
Aramon (2 years)	2	12	—	9.64
Malbeck	—		12.3	7.34
Cariñena	—		10.3	7.65

White Varieties.

Variety.	Yield per acre. Tons	Cwts.	Gravity—Baumé.	Acidity per 1,000—as Tartaric Acid.
Parellada ...	6	8	—	6.12
Subirat Parents	5	18	—	6.73
Garnacha Blanca	4	14	—	5.81
Malvasia Blanca	4	8	—	7.04
Xarelo ...	4	4	—	7.19
Macabeo ...	3	13	—	6.88

The new programme of work was not, at the time of my visit, finally drawn up.

Nursery Work at Villafranca.

From the commencement of reconstitution in Cataluña, the propagation of resistant stocks was entirely left to private enterprise. Energetic Catalans were not slow to seize the opportunity, and at the present time the largest vine nurseries in Spain for the propagation of resistant stocks are to be found in Cataluña. Amongst the most important are those of Don Jaimé Sabaté at Villafranca, and Don Francisco Casellas near Barcelona. The former was the only one I was able to visit. Don Nicola de los Salmones, at Pamplona, had given me a letter of introduction to Don Jaimé Sabaté. He advised me strongly to see this important establishment, the largest in Spain.

Though the bulk of the vineyards of Cataluña have long since been reconstituted, by field grafting as a rule, there is still a certain amount of plantation going on, chiefly replacing of unsuitable stocks, and much of this is being done by means of nursery raised bench grafts. The Catalan nurseries supply vines to the whole of Spain, especially to those regions more recently invaded and now being actively reconstituted, many of which are too cold for field grafting to be really satisfactory. Districts which do not, like Valencia, benefit by the Government supply, obtain their grafted vines from the large nurserymen of Cataluña. The warm, almost Australian climate of the region, insures vigorous growth and the production of healthy, well grown young plants.

The magnitude of operations in Señor Sabaté's establishment is shown by the following figures as to the output for the 1907-8 season:—

Grafted Rootlings	3,022,318
Barbados (ungrafted rootlings)	1,500,000
Graftable Cuttings	3,565,000
	8,087,318

In addition to these 6,715,000 small cuttings, suitable for striking in a nursery, were for sale.

Señor Sabaté explained to me that he has good soil, a good climate and good workmen—these enable him to obtain a high proportion of perfect unions. His books show percentages of from 75 to 80 per cent. with easy stocks, such as 1202, 420A, 3309 &c.; rather less with A.R.G.1.; and about 50 per cent. with 157-11. The business seems to be a profitable one, for he informs me that he has cleared over a million pesetas (£40,000 at par) since he commenced operations, less than ten years ago.

The supplies on hand and prices quoted throw some light on the popularity of different stocks and scions in the district. Though this may not be the best possible criterion of real value it is nevertheless interesting. So far as stocks are concerned their popularity appears to be in the following order, viz., A.R.G.1. ; 1202 ; 41B ; A.R.G.9 ; Rupestris du Lot, 3309. The last two are rather diminishing in favour owing

to high lime contents in many of the soils. No. 93-5 of Couderc is much sought after of late; No. 157-11 is in great favour in Andalucia. It is a stock more suitable for field than for bench grafting. No. 1616 is also in request in Andalucia for swampy soils. The Berlandieri x Rupestris hybrids 301A and 301B are also frequently asked for. Many others are occasionally ordered but in smaller quantities.

The market price of the different stocks is often a fair guide as to their value. The following were Señor Sabaté's prices for graftable cuttings 16 to 18 inches long and not less than ¼ inch in diameter at the small end last season, per 1,000:—

41B, 40 pesetas; 420A, 30 p.; 157-11, 420B and 34E, 30 p.; 93-5 30 p.; A.R.G.9., 35 p.; 1202, 32 p.; A.R.G.1., 30 p.; 1616, Rupestris du Lot and 3309, 25 p.; 3306 and 101-14, 22 p. (1 peseta = 10d. at par.). It will be noted that Riparias are not even quoted.

BENCH GRAFTING—PREPARING CUTTINGS.

A fair idea of the scion varieties most in demand is to be obtained by the number of grafted rootlings Señor Sabaté has for sale. These are as follows:—Tempranillo de Rioja, 1,531,990; Garnacha, 648,293; Cariñena, 287,093; Macabeo (known as White Hermitage at Rutherglen), 192,135; Graciano de Rioja, 140,591; Morastel, 78,550, and various others in decreasing numbers. Of course it must be remembered that Señor Sabaté's orders do not come from Cataluña alone; he supplies all parts of Spain. The large number of Tempranillos are required for La Rioja where replanting is being actively carried on.

Señor Sabaté's calluses all his vines in moss, according to the method first popularized by M. F. Richter of Montpellier, the same which Don Rafael Janini has adopted with such excellent results at Valencia. Grafting, as well as the cutting of stocks and scions to the requisite length, is performed by women—our photograph shows one of the workshops where the latter operation is being performed. Both as regards the kind of graft and callusing material, methods differ from those in vogue at Montpellier and Valencia. Instead of the whip tongue

graft, the shouldered cleft is practised, with a very narrow wedge on the scion. Señor Sabaté employs a special grafting machine made according to his own design; the grafts are bound with raffia.

Instead of callusing in seaweed, ordinary moss is employed, such as M. Richter suggested in his earlier trials. This is obtainable in the Catalan hills at 1 peseta per bag—thousands of bags are secured each season. It may be used a couple of seasons in succession, but fresh moss is preferred, the previous season's being employed for the packing of grafted rootlings. Charcoal is not mixed with the moss (to prevent moulds) nor are the cuttings treated with any antiseptic. The raffia with which the grafts are tied is, however, pickled in a sulphate of copper solution. Moulds appear, nevertheless, to give but little trouble and the quality of the grafted rootlings obtained appeared to me to be all that could be desired. As regards other points, such as moisture and temperature during callusing, the work appears to be conducted on similar lines to those followed at Montpellier and Valencia. The callusing cases contain about 1,500 grafts each and are kept for 25 days at a temperature of 77° F. The callused grafts are planted out in March (September in Australia), in nursery rows 31 inches apart, at intervals of 2 inches from one another. The depth at which they are planted is such that the point of union is a couple of inches above the surface so that when, later on, the protecting mound is levelled it is above ground. Scion roots are cut twice during the season; after the first cutting the mound is reformed, but after the second the graft is exposed so as to harden it off and insure thorough seasoning. Irrigation is largely practised, the nurseries being watered about every ten days during the summer. Manure is generously applied though it is never placed in contact with the young vines. Considerable quantities of sulphate of iron are added in the manure pits. Apart from the usual chemical effect, this is held to destroy many injurious beetles and their larvæ.

Señor Sabaté drove me in a tartana to see several of his outlying nurseries and fields of mother vines. At one of these, grafted rootlings were being lifted; gangs of three men and a boy to each row were engaged at this work. Two men with forks loosened the soil on each side, the third with a very strong two pronged fork was then able to bodily raise the grafted plant from below so that the boy could lift it out without breaking any roots. The photograph reproduced shows this work in operation. I also saw some ground being got ready for plantation in the following March. The work was very thoroughly done and the land was in beautiful order.

We then visited the Finca de la Suerte, where there are some large plantations of mother vines for wood production, and also a fine collection of table grapes; among the former I noticed particularly 20,000 vines of 41B, 28,000 of 1202, 6,000 of 420A, 20,000 of A.R.G.9., and 2,000 A.R.G.1. This property was formerly a vineyard yielding 50,000 gallons of wine but it has now almost entirely been transformed into mother vines, partly by grafting. These were planted at about 6 x 6 feet apart and as usual in European mother vine plantations, they are pruned according to the very short pollard system known as *poda de mimbre* in Spanish (Tête de Saule in French). The vines are not trained or tied up in any way during the growing season; when the cuttings are removed, all shoots are pruned off flush with the old wood of the crown.

A large block of Sumoll grafted on Rupestris du Lot had only recently been converted to A.R.G.9. by regrafting, as this latter stock is coming into favour in the region; these vines were doing remarkably well, as was also a block of 15-year old Rupestris du Lot which had been grafted to 93-5.

These few notes concerning Señor Sabaté's nursery establishment will give some idea of the state of reconstitution in northern Spain. In the south the demand is exclusively for barbados, to be subsequently field grafted. Don Jaimé explained to me that the preference for field grafting in the warm and dry south is chiefly due to the fact that best results are obtained with a very long plant—over 18 inches long—such plants being more resistant to drought during the first few years. To work and handle in the nursery bench grafts of such length is not practicable, hence the preference for field grafting.

In the train, on the trip from Villafranca to Reus, I met a large vineyard proprietor from Vendrell, a neighbouring wine centre—Señor Alegret. His vineyard, which we could see from the train, was established at great expense, a crust of hard limestone being removed with dynamite. He is a great believer in Rupestris du Lot as a stock, and told me that he had tried everything else but had found nothing so satisfactory. No doubt in these poor, stony, but deep soils, conditions are just what is required for this stock.

A Spanish Champagne Vineyard.

Casa Codorníu, the property of Don Manoel Raventos, at San Sadurni de Noyes, is the largest sparkling wine enterprise in Spain. When I was in Valencia, Don Rafael Janini strongly advised me to visit it and gave me a letter of introduction to enable me to do so.

On 24th January, 1908, I took the train to San Sadurni, a large and prosperous village near the valley of the Lobregat and on the line to Villafranca and Reus. The land in its vicinity varies a good deal, being chiefly undulating hills of limestone formation, and alluvial soil near the river. Vines are to be seen everywhere; the soil though mostly unsuited for other forms of agriculture, is an essentially viticultural one.

I had the bad fortune to miss Don Manoel Raventos who was absent for a few days. He is one of the foremost viticulturists in the region. Amongst other positions he holds, he is president of the Instituto Agricola Catalan de San Isidro, to which reference has already been made.

His capataz (manager), Señor Montserrat, very kindly showed me over both vineyard and cellars, enabling me to spend a most instructive afternoon, for Casa Codorníu is, in every respect, a model establishment. It is beautifully situated on the banks of a tributary of the Lobregat; in the far distance are to be seen the serrated crags of Montserrate whilst a few miles away one sees the ruins of the Castle of Subirats, which has played a part in the history of Cataluña.

The vineyard covers some 280 acres and has yielded in a season as much as 198,000 gallons, or an average of 700 gallons per acre. It has been remarkably well established; the whole of the land was subsoiled to a depth of over 2 feet with steam ploughs. Field grafting was the method used for all but the newest portions, for it was planted before the era of nursery-raised bench grafts. Don Manoel, however, prefers the latter method which he applies to all new plantations.

The stocks most largely used in the older portion of the vineyard are Rupestris du Lot and A.R.G.2, on the hillsides; and Riparia Gloire in the rich sandy alluvial soils: almost anything would grow in the latter typical Riparia soil. Various newer stocks are now being tried, and

several interesting experimental plots have recently been established to test them; the above, however, constitute the basis of the vineyards. No. A.R.G.2 is here preferred to A.R.G.1, which is rather unusual. I was told that the grapes are healthier and hang better on the former; they are apt to fall off as soon as ripe on the latter. The yield and time of ripening are the same on each; A.R.G.9 has not yet been tried. Nos. 3306 and 3309 are held in great esteem; in the experimental plots there was little to choose between them. They both bore a heavier crop than Rupestris du Lot alongside; 3309 was if anything the better of the two, whilst A.R.G.2 held an intermediate position. The conditions as regards soil, manuring and cultivation were the same in each case. Rupestris du Lot was best as regards vigour of vegetation. The soil of this vineyard appears to be rather rich for the latter stock.

As regards scions, the Xarelo constitutes about 90 per cent. of the vineyard. *This local white variety is more largely grown than any other in* the district. Morrastel and Macabeo* are also grown.

BURIAL OF VINE PRUNING, SAN SADURNI.

Manuring is extensively practised. In addition to all the marc of the vineyard, some 200 truck loads are purchased annually from a neighbouring distillery. This is supplemented by artificial fertilizers, such as superphosphates, sulphate of potash, &c., as well as large quantities of used animal charcoal from a local sugar mill. Another curious form of manuring is practised, which I had already seen in some other parts of Spain, though nowhere so largely or so methodically applied as at San Sadurni. This is the burial in short trenches of the prunings of the vines, as well as of any sort of vegetable refuse available. The photograph shows a row of vines with these trenches, about 20 inches deep, open for the reception of the stuff to be buried. The trenches are opened every 5th or 6th row, *some years elapsing before a return is made to the same row again.* The beneficial influence of previous years' treatments on the vegetation of the vines was very evident. This practice is considered to act quite as much by facilitating retention of moisture, as by the plant food which is added

* Macabeo is the sort grown at Rutherglen under the erroneous name of White Hermitage.

to the soil. Strange to say, this decaying vine *débris* does not seem to bring about the growth of any parasitic vine root fungi, as might be feared. The method is one which has long been practised about here.

The vines are usually planted 6 ft. 6 in. x 3 ft. 3 in. and not tied up in any way. Some are, however, long pruned, the rod being bent round and tied to the crown. In some portions of the vineyard a departure from this method has been made, the vines being planted 6 ft. 6 in. x 6 ft. 6 in. and trained on a single wire to which the rods, two of which were left on each vine, were tied.

LIFTING GRAFTED ROOTLINGS IN NURSERY.

In one of the bends of the river, was a small flat of beautiful rich soil in which were 20 acres of Xarelo, grafted on Riparia Gloire, planted at 6 ft. 6 in. x 6 ft. 6 in. and trained on 4 wires. The growth was magnificent though the vines were 12 years old, but the soil was essentially a Riparia one. This block had yielded, the previous vintage, 21,000 gallons of wine or a little over 1,000 gallons per acre.

The champagne cellars are on a very large scale and splendidly equipped. French champagne makers have been engaged and everything is done exactly as in the Champagne district. I was strongly reminded of Great Western in these long galleries full of bottles, cork downwards, in the usual shaped racks. I was further reminded of the similarity, as most of the galleries were not vaulted over, the soft Tertiary sandstone being sufficiently solid to dispense with such. The formation, however, was quite different to the decomposed granite of Great Western.

These galleries, of which there are altogether 2,800 metres (nearly $1\frac{3}{4}$ miles), are at an average depth of 70 feet below the surface; they are well lighted by electricity and well ventilated.

FIGUERAS.

On 27th January, I left Barcelona for the north and for France. I decided to break my journey at Figueras, the most north-easterly town, of any size, in Spain, in order to see the Viticultural Experiment Station which had been created by Don Nicola de Los Salmone, before he was promoted to Pamplona. My main object was to see something of recon-

stitution in the stiff primary soils I have already referred to, and which I expected to find about here. Gerona is the capital of the province of the same name and Figueras, also in the same province, is situated 25 miles further north and only a dozen miles from the French frontier.

Figueras is in the centre of a rich agricultural district, known as the Ampurdan—an alluvial plain surrounded on three sides by steep hills, the lower slopes of which constitute undulating land admirably suited for the cultivation of the vine. Figueras is picturesquely situated with the Mediterranean and the Bahia de Rosas on one side, and Canizcu, one of

ALOES AS FODDER, FIGUERAS.

the snow-capped giants of the Pyrenees away to the north-west. The olive is also much cultivated in the neighbourhood, but the algarrobo is no longer to be seen. I was told that it is here too cold for it. Further inland are immense forests of cork oak. Maize is largely grown in the Ampurdan; it appears to be the principal crop in the richer land.

I presented a letter of introduction to Don Antonio Subias Gonzalvo, by whom I was most kindly received and who took me for a long walk to show me what was to be seen of most interest from a viticultural point of view. I came across what was to me a new fodder plant. The season had been a very dry one and hay being scarce and dear, anything that could serve as a substitute was turned to account, even the aloe hedges (*Agave Americana*) were used for fodder. The large fleshy leaves, after removal of their thorny edge, were chopped up and fed to cattle. So far as I could gather no ill effects followed the consumption of this strange diet. The photograph shows some aloes from which the large leaves had been removed for this purpose.

So far as my quest for stiff Primary soils was concerned, my visit to *Figueras was a disappointment. Its vineyards are situated on Secondary* and Tertiary hillsides. It was to Llansa, still further north, that I would have to go to find what I was looking for. Don Antonio very kindly gave me a letter to a friend who owned vineyards at this place, and I decided to visit him the following day.

The wines produced near Figueras are chiefly full bodied dry reds with much colour, such as used to be shipped to France during the phylloxera wine famine. These wines are chiefly made from Carigneña grafted on Rupestris du Lot, A.R.G.1., 1202, 3309, &c. No. 1202 is said to do well in clay soils which are very prevalent.

Space will not permit a full description of the viticultural station, in which I was much interested. Among other experimental work, direct producers are receiving much attention; the most promising of these were Nos. 251-150, 199-88, 89-23 and 81-115 of Couderc, 48-156, 209-1028 and 1077 of Siebel, and Gaillerd-Girerd's No. 157. Some of the wines made from these were interesting; in particular, 251-150 Couderc, with rather a sherry character, and 48-156 Siebel, which was distinctly Rancio.

(To be continued.)

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The proper means of adding to or maintaining the fertility of orchard land is an important problem to fruit-growers generally and especially to those new to the business. The conditions under which fruit trees are grown in various parts of Victoria are widely different and the means that would be most reasonable at Bendigo for fertilizing an apple orchard, would not be at all suitable at Portland and other cool and moist districts.

The advice to plough into the soil large quantities of stable manure annually, or to grow winter crops of peas for ploughing under in spring, irrespective of condition of soil and climate, and age and productivity of trees, is likely in many instances to entirely mislead the beginner who is unable to distinguish, by the condition of his trees, between a fair and rational supply of plant food in his soil and gross over-feeding. It may be generally accepted that no manure whatever, and a minimum amount of cultivation are required where the trees are young and vigorous, producing no fruit, or fruit of abnormally large and gross character. On the other hand, where the trees are bearing heavy crops of fruit, and the growth is meagre, a great amount of cultivation and an abundant supply of plant food material are absolutely necessary. The line of demarcation between a sufficient supply of moisture and food and a deficient supply is often very fine, and the cultivator is wise who decides to err on the side of abundance when his trees are bearing well and the conditions are generally unfavorable to excessive growth.

Farmyard manure is undoubtedly the most beneficial material available for fertilizing poor and hot soils, while in cool districts—where it is generally to be obtained in fairly large quantities—the effect produced by its liberal use is frequently a gross amount of growth, and a sample of fruit particularly liable to "bitter pit" and other maladies. The keeping of pigs, cows, and horses above the requirements of the orchardist for the sake of a supply of manure is positively bad practice, and this view is

supported by the fact that the most successful orchardists at Doncaster, Diamond Creek, and other districts where the conditions require a fair amount of stable manure, find it far more profitable to buy and cart manure than attempt to make it.

The most efficient substitute for stable manure is a leguminous crop ploughed into the soil early in spring before severe evaporation begins. The crop generally cultivated for the purpose is the field pea. The plan of cultivation for the complete fertilization of fruit-growing land which is now generally adopted in districts in Victoria remote from a supply of farmyard manure is as follows:—The ground is broken up after the crop of fruit is gathered, and cultivated to form a good seed bed. Peas are sown, in drills or broadcast, with superphosphate at the rate of 2 cwt. per acre. In some cases sulphate of potash, at rate of 1 cwt. per acre, is added after the peas are sown, and lightly harrowed in, it being accepted that a supply of this manure is necessary, especially in light soils. In early spring, the crop of peas is ploughed in and the soil well cultivated to produce a level well pulverized surface. By the means stated vegetable matter, nitrogen, phosphoric acid, and potash, are added to the soil, thus furnishing the most important fertilizing substances, and improving, by means of the vegetable matter, the physical condition of the soil.

The application of lime to orchard land is often a matter of urgency. In addition to its being a plant food, lime is most important as a corrective of acidity. In heavy soils well supplied with humus and fairly drained and cultivated, fruit trees often fail to thrive, owing to a deficiency of lime. Rather frequent and light applications are preferable to the old plan of a heavy dressing about every five years. From 3 to 5 cwt. per acre is a fair dressing for rich land deficient in lime. It should be applied in winter after the soil is ploughed and be harrowed in, a freshly slaked and finely pulverized sample being most effective.

An easy method of ascertaining whether one's land contains too great a degree of acidity, is to place a piece of ordinary blue litmus paper on a sample of moist soil; if the paper rapidly turns a vivid pink, it may safely be assumed that the land requires a dressing of lime. If the change of colour is effected slowly, it is an indication that, while lime is needed, a light dressing will suffice. Small books of blue litmus paper may be procured from any chemist.

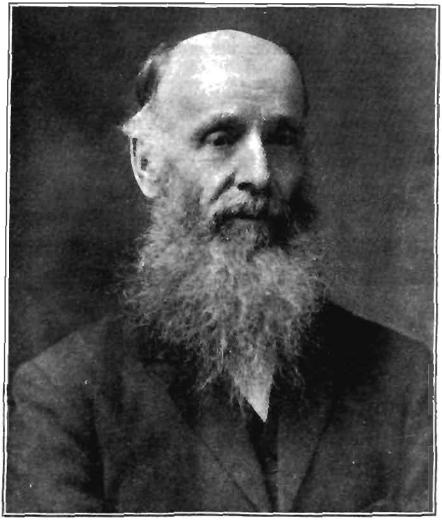
Where it is intended to plant new orchards, or extend old plantations, the soil should be thoroughly prepared before the planting season arrives, by deeply ploughing and cultivating. In very poor soils, manure should be added, principally with a view to moisture conservation during the growing season. Intending planters should carefully read the excellent article which appeared in the July 1908 issue of this *Journal* on the subject of "Raising an Export Apple Orchard" from the pen of Mr. P. J. Carmody, Chief Inspector of Vegetation Diseases.

Two very common and destructive pests are the Woolly Aphis or American blight, and the *Bryobia* mite, commonly known as red spider. The best time to attack these pests is during the dormant season. Woolly aphis should not be allowed a moment's rest. It will probably require two thorough sprayings to eradicate it. Red oil or crude petroleum emulsions are effective against both aphis and mite. Prune affected trees early and spray thoroughly. If any survive, spray again about August.

A PIONEER ORCHARDIST.

Mr. James Lang, "Langdale," Harcourt.

As mentioned by Mr. Cronin in the "Orchard Notes" last month, Mr. Lang has, on account of pressure of private business, ceased for the time being to be a contributor to the *Journal* in which capacity he has rendered valuable help to the fruit-growing industry. Mr. Lang's papers on orchard work have been running on month by month since 1902, and the Editor gladly takes this opportunity of acknowledging his indebtedness for so many years steady work.



Mr. Lang, whose photograph is reproduced, can reasonably claim to e one of the pioneer orchardists in this State. He came to Victoria with is parents in 1853, and started fruit-growing at his present orchard in 865. He was awarded the silver medal of the Royal Horticultural Society of England for apples (24 varieties) exhibited at one of the meetings of the Society in 1886. Two years later, in conjunction with Mr. H. Ely, of Harcourt, he was the first orchardist to export fruit on a commercial basis to London, and has continued exporting since that date.

In addition, the subject of this brief sketch was one of the members f the Horticultural Board of Advice under the Department of Agricul-

ture, and for a number of years was on the Committee of the Royal Horticultural Society of Victoria. He has also acted as examiner in connexion with the selection of inspectors under the Vegetation Diseases Acts.

STATISTICS.

Rainfall in Victoria.

FIRST QUARTER, 1909.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin.	January.		February.		March.		Quarter.	
	Amount, 1909.	Average.	Amount, 1909.	Average.	Amount, 1909. *	Average.	Amount, 1909. *	Average.
	points.	points.	points.	points.	points	points.	points.	points
Glenelg and Wannon Rivers	110	122	66	91	192	147	368	360
Fitzroy, Eumerella, and Merri Rivers	171	145	78	170	198	163	447	478
Hopkins River and Mount Emu Creek	166	144	75	106	179	158	420	408
Mount Elephant and Lake Corangamite	220	148	77	109	224	174	521	431
Cape Otway Forest	214	211	149	146	217	261	580	618
Moorabool and Barwon Rivers	214	141	140	116	195	177	549	434
Werribee and Saltwater Rivers	220	139	176	131	129	186	525	456
Yarra River and Dandenong Creek	343	222	184	171	184	283	711	676
Koo-wee-rup Swamp ...	248	242	164	158	214	274	626	674
South Gippsland	243	223	284	165	215	322	742	710
Latrobe and Thompson Rivers	253	230	186	161	160	295	599	689
Macallister and Avon Rivers	173	144	347	136	117	216	637	496
Mitchell River	224	238	304	214	241	224	769	676
Tambo and Nicholson Rivers	221	199	343	152	129	290	693	641
Snowy River	324	247	525	198	73	284	922	729
Murray River	60	114	98	101	203	156	361	371
Mitta Mitta and Kiewa Rivers	191	167	117	144	389	303	697	614
Ovens River	114	178	88	134	420	280	622	592
Goulburn River	175	131	124	100	194	175	493	406
Campaspe River	124	116	142	91	203	147	469	354
Loddon River	102	95	96	82	147	115	345	292
Avon and Richardson Rivers	85	71	109	63	161	93	355	227
Avoca River	82	66	65	62	127	105	274	233
Eastern Wimmera	116	68	50	60	148	81	314	209
Western Wimmera	78	82	47	77	98	117	223	276
Mallee District	63	55	56	57	111	77	220	189
The whole State	160	130	135	102	178	176	463	408

* Figures in these columns are subject to alterations when the complete number of returns for March has been received.

H. A. HUNT,
Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 31.3.1909.	Quarter ended 31.3.1908.	Quarter ended 31.3.1909.	Quarter ended 31.3.1908.
Butter	lbs.	4,756,988	9,578,492	2,627,688	6,392,064
Milk and Cream ...	cases	4,519	8,610	96	..
Cheese	lbs.	120,000	243,720	29,750	108,810
Ham and Bacon ..	"	375,120	506,400	...	...
Poultry	head	.	13,027	397	1,701
Eggs...	dozen	...	5,100	3,819	10,090
Mutton and Lamb	carcases	191,474	203,005	17,193	22,465
Beef	quarters	3,239	28	543	110
Veal	carcases	608	1,074	301	201
Pork...	"	...	402	876	23
Rabbits and Hares ...	pairs	503,616	294,880	149,638	78,264
Sundries	lbs.	...	...	10,454	34,725

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.		Goods.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.		Inter-State.	Oversea.	Inter-State.	Overse
les ...	39	1	29,454	145,397	Nectarines	1	—	123	-
icots ...	1,358	—	245	1	Nuts ...	113	1,158	2	-
anas, b/s.	88,747	—	—	—	Oats ...	1,818	1,333	—	-
anas, c/s.	6,836	291	434	—	Oranges ...	30	2,872	208	1
ey ..	59,041	—	—	—	Passion fruit	982	—	63	-
ns ...	300	209	1	—	Pineapples	20,786	—	383	35
kberries	392	—	—	—	Peaches ...	9	—	6,397	14
k Cur-	2,705	—	—	—	Pears ...	67	—	95,228	9,93
nts				—	Peas ...	1,304	—	617	-
...	343	—	—	—	Peas, dried	2,984	497	—	-
s ...	28	141	6		Plants ...	63	301	27	-
ries ...	53	—	18	90	Plums ...	106	—	5,531	6
ies ...	—	176	—	—	Pomeloes ...	—	10	—	-
a-Pods	—	18	—	—	Popcorn ...	3	—	—	-
mbers	114	—	1	—	Potatoes ..	3,707	1	—	-
l Fruit	-	4,730	885	3,026	Quinces ...	—	—	80	
c ...	16	—	—	—	Raspberries	—	—	2	-
eberries	1	—	—	—	Rice ...	3,941	47,841	—	-
es ...	103	2	271	922	Seed ...	2,026	11,085	—	-
Ginger	10	1,118	3	—	Tapioca ...	—	12	—	-
ons ...	—	8,726	206	—	Tomatoes ...	87	—	163	-
...	25	—	—	—	Turnips ...	414	—	—	-
...	221	2,128	—	—	Watermelons	—	—	—	:
...	30	—	—	—	Wheat ...	23	68	—	-
oes ...	12	—	—	—	Yams ...	—	287	—	-
ns ...	7	—	—	—	C'nned Fruits	—	—	—	1,60
l Fruit	2	24	432	45	Jams, Sauces.	—	—	—	1,17
egs	—	68	—	—	&c.				
al ...	160,383	17,632	31,956	149,481	Grand Totals	198,847	83,097	140,780	162,78

Total number of packages inspected for quarter ended 31st March, 1909 = 585,508.

J. G. TURNER, *Senior Inspector, Fruit Imports and Exports.*

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as ll particulars as possible, of your local conditions, and state precisely what it is that you want to know. l inquiries must be accompanied by the name and address of the writer.

NAVEL RUPTURE.—R.C. and J.T.G. ask how to treat foals suffering from navel ıpture.

Answer.—Cast the foal on its back and carefully manipulate the rupture ntil the contents have passed back again into the abdominal cavity. Great care . necessary that this is complete and only a sac of skin is left. This may then e drawn together tightly, as close to the wall as possible, in a ligature of waxed ord. In the course of a few days the portion of skin will drop off, and if the eduction has been carefully done, the inflammation resulting will block up the pening and healing will take place.

CONTINUOUS BREEDING FROM MARE.—H. McC. states that he has bred two oals from a medium mare, 7 years old, and has stinted her for a third foal. He sks whether it is advisable to keep breeding from her every year.

Answer.—No harm will arise from breeding continuously, taking into con- deration the age of the mare.

CLEANING OATS.—P.S. states that, among the oats threshed in his district iis season, there is a small percentage, in some cases, of barley.

Answer.—The only economical manner in which barley can be partially moved from oats is by grading, which removes all foreign seed as well as cracked nd immature oats. There are numerous types of graders on the market.

HARVESTING MAIZE.—E.S. inquires when maize should be harvested.

Answer.—When maize is intended for grain the cobs should be allowed to emain on the stalks till about the middle to end of April. No harm will come ı them in this way, and there will be no necessity to artificially dry them. Vhen the cobs are subsequently picked the husk should be removed and the cobs laced in a "crib" with wire netting sides to allow free access of air. After maining three or four weeks in the crib they can be threshed by hand or by a ıechanical sheller. If intended for silage the maize should be cut with the cobs ill attached just at the period when the grain is in the milky stage. If maize ıtended for silage is left to completely mature cobs, it becomes too dry and brous. There is no variety which will yield both grain and green stuff for silage.

GROWING LUCERNE FOR SEED.—P.E.S. asks how to grow lucerne for seed.

Answer.—Lucerne for seed purposes is grown in the same manner as for odder. It is customary to keep the second or third cutting for threshing on ccount of it being more free from weeds. When the seed pods are fully formed and ecoming dry, which can be found by examination of a number of plants throughout ie field, the crop should be cut with a mower or scythe. The threshing may be one in any small machine or by flail. Threshing destroys the plant for feed urposes by knocking all the leaves off. The stalks may come in useful for pigs · dry stock. Lucerne seeds always ripens unevenly, and the best that can be one is to seize the moment when the majority of the pods are matured and then ıt and thresh shortly after. It may need a season's experience to judge the orrect moment for cutting for seed. A germination test of 100 seeds in wet annel or blotting paper will be a good guide as to the vitality of the seed.

GRASSES FOR MOUNTAIN SPURS.—X.Y.Z. writes:—"Please let me know of good hardy grass to grow on the north sides of spurs which have become bare. verage rainfall is about 26 inches, and the country is used for sheep. The soil good, but in places is very shallow, resting on limestone. Frosts are fairly vere."

Answer.—For thin soils with a calcareous subsoil on mountain spurs at an levation of 1,500 feet and with a rainfall of 26 inches, the following grasses ıould be tried to cover the parts that have become bare with fresh vegetation:—) Tall Oat Grass, ***Arrhenatherum avenaceum***, Beauv. (*Avena elatior*, L.); (2) olden Oat Grass, ***Trisetum flavescens***, Beauv. (*Avena flavescens*, L.); (3) Crested og's Tail, ***Cynosurus cristatus***, L.

The seed of Nos. 1 and 2 is often impure, and that of No. 2 especially is ıther dear. No. 3 is perhaps the most generally suitable, and might be mixed ith (4) Sheep's Fescue (*Festuca ovina* L.).

To give the best results, the pasture mixture must include seeds of some guminous plants. Three suitable for the conditions given are:—(5) Common

Bird's Foot Trefoil (*Lotus corniculatus* L.); (6) Kidney Vetch (*Anthyllis vulneraria* L.); (7) Sainfoin (*Onobrychis sativa* L.).

WATTLE CULTIVATION.—H.H.W. inquires as to best variety of wattle for production of bark. The land is in the Lillimur district, and is poor white sand growing honeysuckle, heath, oak bush, &c.; mallee flats alternately between stringy bark ridges. Rainfall is about 19 inches per annum.

Answer.—The tan wattles usually grown in Victoria for the production of bark are the black feather leaf species (*Acacia decurrens*) and the broad leaf golden wattle (*A. pycnantha*). It is not likely that either variety will produce a strong tan-yielding bark in the district described, although *A. pycnantha* will grow fairly well there. It has been tried in the Ninety Mile Desert of South Australia under varying conditions, and there, it is said, has produced weak bark. Strong loamy, sandy, granitic, or ironstone soils suit wattles best, but they also require shelter and moisture. The seed, after being steeped for about 24 hours in water heated nearly to boiling point (to soften the outer shell), may be sown after ploughing and harrowing, or it may be lightly covered with a rake on burnt areas, or hoed or dibbled in. A bulletin on this subject will be published shortly by the Forests Department.

PLANTS FOR IDENTIFICATION.—Specimens of plants for identification have been forwarded by various correspondents.

Answer.—

1. (R.McM).—*Melilotus parviflora*, Desf., Small Flowered Melilot or King Island Melilot, and is the plant known as Hexham Scent in the Darling Downs. It is an introduced plant now naturalized in this State. An annual or occasionally a biennial. On good pastures it is a weed if present in excess, since its aromatic principle then affects the health, meat, and milk of stock eating it. A small quantity adds to the fragrance of hay and also its palatability, and is useful in mixed fodder. The chief, and, in fact, the only practical use of the plant is to grow on poor sandy or newly reclaimed dry soils where good pasture plants will not grow, and where cultivation and manuring are out of the question. The plant is an energetic nitrogen fixing one, and will grow on poor soils, which it steadily enriches with humus and ultimately renders them fit for better plants.

2. (R.McM.).—*Plagianthus spicatus*, Benth., Spike-flowered Plagianthus, a native member of the *Malvaceæ*, useless for fodder but apparently not poisonous or actively injurious. A New Zealand species yields a kind of cotton. *P. spicatus* is very plentiful in Victoria. It takes up the place of useful vegetation and its spread should be checked.

3. (H.S.U.).—*Polygonum aviculare*, L., Knot-weed or Hog-weed, a small wiry annual prostrate on open ground, erect when between other vegetation. Its triangular seeds are a common impurity among agricultural seed, and the plant was originally introduced to the State in that way. It is spread over nearly the whole world. The seeds last for some time in the soil, hence it can only be kept down by continually working the soil, or suppressed by other vegetation. In this respect the addition of lime to the soil (½ to 2 tons per acre) is usually of great value. The plant has a slight value during part of the year as fodder for stock, but on all cultivated land is a great nuisance, though hardly a dangerous pest. The plant was formerly used for healing wounds and ulcers, and has been used in Algeria for malaria. It is not in any modern Pharmacopœia and has no recognised medicinal value at the present time.

CRUSHED *versus* WHOLE GRAIN FOR PIGS.—A.G. inquires whether crushed grain is preferable to whole grain for feeding pigs.

Answer.—Crushed wheat or barley soaked is recommended; if not crushed, boil well. Cook all milk. The following is the most profitable food for pigs and the best pork producer, viz.:—1 gal. skimmed milk; 3 lbs. potatoes; and 4 lbs. crushed barley per pig per day. On this food, pigs from 80 to 120 lbs. weight will put on 15 lbs. of pork per week, which at 4d. per lb. is 5s. per pig per week. The following are the values of the different feeds:—

Crushed barley (4 lbs.), milk (1 gal.), and potatoes (3 lbs.) ...	1,000
Barley meal (8 lbs.) and milk (1 gal.)	903
Maize meal (12 lbs.) and milk (1 gal.)	877
Maize meal (6 lbs.) and bean meal (6 lbs.)	590
Barley meal (10 lbs.)	519
Maize meal (8 lbs.) and pea meal (6 lbs.)	489
Maize meal (14 lbs.)	484
Barley meal (8 lbs.) and bran (3 lbs.)	499
Maize meal (12 lbs.) and bran (4 lbs.)	404

THE JOURNAL

OF

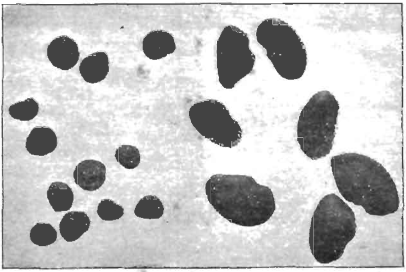
The Department of Agriculture.

Vol. VII. Part 6. 10th June, 1909.

HARVESTING LUCERNE FOR SEED AND HAY.

Elwood Mead, Chairman, State Rivers and Water Supply Commission.

Of all the hay crops so far tested in Victoria, lucerne gives the best results. Not only is the average yield the largest, but it meets the greatest variety of needs. It is the best hay crop known for feeding and fattening sheep and lambs. No crop gives better results when fed to the dairy herd or to lambing ewes, because it contains all the constituents of milk. It is especially valuable as a food for young stock or for run down or weakened animals of any kind; hence, it is well suited to meet the emergency demands of the lean years of drought.



1. DODDER (AT LEFT) AMONG LUCERNE SEED.

As the pastoral and dairying interests expand, so will the use of hay increase and the demand grow, in like measure. It is now the leading irrigated product in the United States and Italy, occupying two-thirds of the irrigated area in the first and more than any other single crop in the second; and it seems likely to assume the same commanding position in all Australian irrigated areas not given over to fruit. Every question

connected with its production and marketing has, therefore, a direct relation to the development of irrigation, for the benefits of irrigation depend wholly upon the character of the crops grown.

IMPORTANCE OF GOOD SEED.

The first thing to be considered is seed. We need pure seed and a variety suited to this soil and climate. To secure these we must begin to grow our own seed and to develop types adapted to home conditions. Victoria is already showing the ill effects of depending wholly on other States or other countries for seed. This is shown in the large number of fields infested with dodder and in the reduced yields due to sowing inferior

2. HAY SWEEP GATHERING UP LOAD FROM WINROWS.

varieties. Great benefits will result from a systematic movement to grow and improve our own seed.

The price and the assured demand make this worth the attention of the Victorian farmer. This season over 100 tons will be imported at a

3. HAY SWEEP CARRYING LOAD TO STACKER.

cost to farmers of about £10,000. This is the situation when the growing of this crop is in its infancy. Its acreage is certain to extend with the extension of irrigation and with the recognition of the value of the crop in the sections of ample rainfall. It seems likely that all the seed that will be grown for several years will find a home market.

GROWING AND HARVESTING SEED.

The yield of seed depends on the season and this influences the decision as to whether a crop shall be cut for hay or seed. This is especially true in districts with considerable rain. A luxuriant growth is not favorable to a heavy yield of seed. Arid districts where irrigation is required are much the best for growing seed, as here the growth can be controlled by scanty watering.

The practice in New South Wales is to grow two crops for hay and let the seed ripen on the third. To grow one seed crop requires about as

4. HAY SWEEP DEPOSITING LOAD ON STACKER.

much time as two hay crops, and in favorable years two seed crops in one season have been secured. In order to still further check the growth of foliage and increase the number of seed bearing heads, some growers in America clip the tops off the growing shoots when about 8 inches high.

5. LOAD BEING ELEVATED BY STACKER.

This is done with a mower set high, and causes the stems to branch. When fully ripened, the practice in New South Wales is to cut with a mower and stack the same as hay, care being taken to have it fully cured, as heating would destroy the germinating power of the seed. In America some growers cut with a reaper and binder.

Threshing may be done with an ordinary grain thresher by adjusting the cylinder and having a special set of screens, but the practice in New South Wales seems to be to thresh with a special machine. This looks like a grain thresher and several makes are in use, one being made in New Zealand, and others in England. The charge for threshing is 12s. to 14s. for a sack of 300 lbs., or 40s. a day if the crop is poor and less than four sacks a day are secured. This charge covers the use of engine, and thresher and the wages of three men to operate them.

The straw which comes from the thresher is badly broken, and not equal to hay, but it finds a sale as food for fowls or dairy herds.

The growing of a seed crop does not seem to affect the vitality of the plant, as it starts growing as quickly after the removal of a seed crop as after the removal of a hay crop. The yield varies from next to nothing to over 400 lbs. to an acre, but varying as a rule between 150 and 300 lbs. It pays well at 6d. per lb. and will be exceedingly lucrative at the prices which have prevailed in this State for the last five years. It needs, however, enough growers of a district to warrant the purchase of a thresher, as these are expensive, costing about £300.

6. LOAD ELEVATED READY FOR DROPPING ON STACK.

Professor Buffum, in his book on *Arid Agriculture* just published, makes the following recommendations about sowing lucerne for seed :—

"Lucerne for seed should not be sown as the ordinary hay crop. To secure plants which are far enough apart to make strong, thrifty growth; to secure proper fertilization of the flowers; to prevent crowding; to favour cultivation and irrigation, seed should be thinly sown in rows from two and one-half to three and one-half feet apart. The method recommended is to take off the shoes or stop up the holes of a drill to make the rows as wide as wanted, and then plant as little seed as possible (2 or 3 lbs. per acre). The small amount of seed may be mixed with ashes or soil to help spread it evenly. When the plants come up, if they are too thick in the row, they may be spaced with a hoe, as with sugar beets, or when very small may be harrowed crosswise to take out part of the plants."

VARIETIES.

On its experimental farm at Tatura, the Commission has the following varieties now growing, viz. :—Turkestan, Arabian, Hunter River,

French and Peruvian; also seed from Utah, California and Queensland, of which the variety is not known. Seed has also been secured from the Tamworth district in New South Wales, and Senator McColl has purchased for the Commission 50 lbs. of seed from a plant breeding farm in Wyoming, which it is intended to distribute for trial. Only one year's

7. STACKER DESCENDING AFTER DROPPING LOAD.

trial has been had of the above named varieties. In this, the Queensland seed and the Arabian made the most vigorous growth and the last named promises to grow well in winter. The yield was smaller, as, owing to the seed being about twice the size of the other varieties, it was sown too thin. There seems no doubt that Australian grown seed does better than imported

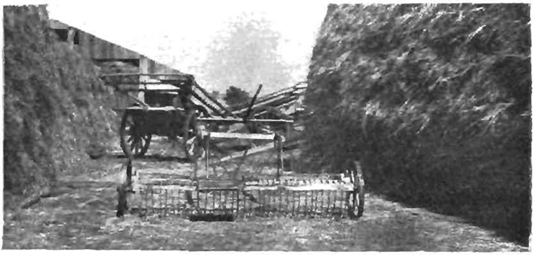
8. STACKER RETURNING FOR ANOTHER LOAD.

and this explains the popularity of seed from Hunter River. Still better results will come, it is believed, from seed grown on sparingly watered irrigated land.

It is claimed that Peruvian is the best winter growing variety, but it will be another year before any conclusion as to that claim can be arrived at here.

THE GROWING OF LUCERNE FOR HAY.

There is a wide spread belief that only rich river flats with exceptionally deep soil are suited for growing hay. Time will show this to be a mistake. The Mallee soils with manure will give equal yields, and much of the clay and sandy land of the North only needs such treatment as will restore to the soil the humus it has lost by growing wheat to make lucerne hay the best paying crop which can be grown. This does not mean that all soils will grow lucerne. Some of the thin clay soils of the Northern irrigated districts will not, and there are places where the growth is checked by an excess of common salt in the soil. This latter has proved the case in parts of the experimental plot at Tatura.



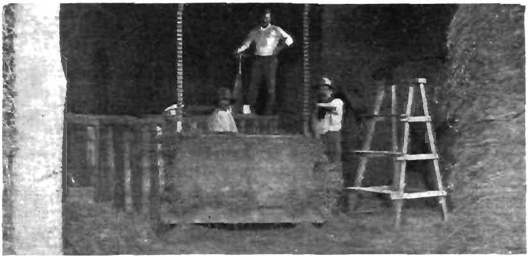
9. SMALL WHEEL HAY RAKE USED IN NEW SOUTH WALES.

On suitable soil from 3 to 6 crops a year can be grown, and yields from half a ton to one and a half tons to a cutting are reported. Nothing less than half a ton will pay, and the aim of every grower should be to raise the yield to a ton a cutting. It is believed that in most of the irrigated area the yield can be doubled by careful watering coupled with manuring the soil. The trouble with the clay soils is lack of vegetable matter. To provide this, is an important problem of irrigation in Northern Victoria.

HARVESTING AND MARKETING HAY.

The quickest way to turn hay into money is by pressing and forwarding to market. In this, the use of modern hay-making machinery is an important factor. It not only relieves hay-making of its most laborious and disagreeable features, but reduces its cost by half. Using a sweep rake, a hay stacker and a power press, hay can be cut, pressed and made ready for sale or shipment for 10s to 12s. a ton. It can be cut and stacked for 5s. a ton; and it has been pressed this season by one Victorian grower for 4s. 6d. a ton. The accompanying photographs taken at the Cohuna demonstration this year show the tools used for gathering and stacking. With these implements the only hard manual labour required in hay-making is to place the hay on the stack. Horses cut, rake, haul and lift it on to the stack. Likewise, in pressing, all the hard labour needed is to feed the hay into a hopper, and fasten the wires on the bales. Horses or a steam engine do the rest. In New South Wales, methods requiring much hard manual labour are still largely employed.

Illustrations 9 and 12 show scenes in the hay fields of the Tamworth district. The rake (No. 9) has low wheels and makes small winrows. In preparing for shipment, the bales are cut out of the stack the exact size they are to be pressed and then layers are placed in a hand press (No. 10), and compressed to the right thickness. After this is done, all the ragged edges are trimmed up and the corners rounded off with a knife. The final result under this method is not as good as where the horse does the sweating. This is shown by the following extract from a letter received from Messrs. W. S. Keast & Co., telling of sales of several consignments of hay from the Goulburn Valley at £5 per ton:—"We might say that the lucerne from the Goulburn Valley which we have received this year has given great satisfaction and is bringing a price ahead of consignments from Sydney."



10. BALING HAY.

The following figures as to the cost of making hay in the Tamworth district were furnished by Mr. A. F. Burgess, one of the largest growers of hay in that Valley:—

	£ s. d.
Making hay and putting in shed	0 9 0
Pressing	0 9 0
Carting to railway station	0 2 6
Freight and commission	0 16 8
Total cost per ton	1 17 2

When these figures were given, hay was selling in Sydney at £4 6s. 0d. per ton, leaving a net profit per ton of £2 8s. 10d.

By the use of modern tools and methods, the Victorian irrigation farmer can reduce the above costs of making and pressing hay by 8s. or 9s. per ton, which is considerably more than all the expenses of irrigation; while the sunny days and the small rainfall which prevail in the areas requiring irrigation are great advantages in haymaking.

While the present local demand for hay is far greater than the supply and a ready market at good prices is likely to continue, it is not believed that this will be the chief way of disposing of the crop. Many will find it more profitable to feed their hay on the farm. A ton, by measure, of green hay weighs from six to eight times as much as the same bulk of dry hay and has greater feeding value. Its use in the hand feeding of dairy

herds and the fattening of sheep and lambs is likely to reach the same proportions here as elsewhere. Some results secured from hand feeding green hay in summer, and silage in winter, would seem incredible if they were not so well authenticated. One example from the *Agricultural Gazette of New South Wales* of May, 1903, is worth repeating. During the drought of 1902, Mr. N. A. Gatenby of Forbes, said, in a public address, "that 200 acres of lucerne

11. A CHEAP AND CONVENIENT SILO.

would feed 15,000 sheep four months." This was challenged, and to prove the correctness of his statement he turned over to the Government a lucerne meadow of 22½ acres. On the hay from this meadow, 1,687 sheep, or 75 to the acre, were fed from October to March, and at the end of the test had gained on an average 3 lbs. each in weight. The fattening of cattle, sheep and lambs in the United States consumes each

12. HAY STACKS AND HAY SHEDS, TAMWORTH DISTRICT, N.S.W.

year more hay than will be produced in Australia for many years. The market for these products is unlimited and hence no fear need be felt about getting the market for hay. During a recent trip in New South Wales, and during visits to Bacchus Marsh, several farmers have given results of cultivation and feeding in which 1 acre of ground supported 3 cows. This was under intense culture with the soil heavily manured and with a small acreage of other fodder crops to supplement lucerne.

In feeding lucerne a cheap and convenient silo becomes an important factor. Illustration No. 11 shows one that meets both conditions. It is a trench 70 ft. long, 18 ft. wide and 8 ft. deep with sides of plank extending 7 ft. above ground and with an iron roof. This gives a silo of 500 cubic yards capacity. In filling, the teams drive through over the silage, and by using tip drays or sling ropes to dump waggons, it can be filled at very small cost. Where dairy herds are fed, the practice is to cut each day the quantity required until it has reached the proper period of growth, when the remainder of the crop is cut for silage.

This article is only intended to deal with the harvesting of lucerne seed and lucerne hay; therefore no attempt has been made to describe methods of planting, cultivation or watering.

LUCERNE HAY COMPETITION.

The State Rivers and Water Supply Commission has, with the concurrence of the Honorable the Minister of Water Supply, decided to offer a series of prizes, as set out hereunder, to the farmers producing the largest yield of lucerne hay from five acres of land in—

(1) Rodney Irrigation District—One prize, value £10;
(2) Cohuna and Koondrook Irrigation District—One prize, value £10;
(3) Swan Hill and Nyah Irrigation District—One prize, value £10;
(4) Remainder of the State—One prize, value £10.

The conditions will be as follow:—

1. There must be not less than five contestants for each prize.

2. Those wishing to take part in this competition must notify the Secretary of the State Rivers and Water Supply Commission on or before 1st July, 1909.

3. The competition in 1909 will be restricted to land seeded after 1st March, 1909. Its location must be definitely stated in the notice of competition.

4. The award will be made on or about 1st May, 1910, and will be based on—

(*a*) The total weight of hay cut and stacked between the time of planting in 1909 and 1st May, 1910. This to be determined by weight or measurement, as the Committee on Awards may decide.

(*b*) Where two competitors tie for a prize so far as weight of hay obtained is concerned, the one using the least water shall have preference.

(*c*) The hay when cut must be stacked by itself near or on the plot where grown.

5. No condition will be imposed as to the method of seeding, watering, tillage, or cutting. Each competitor will be left to use his knowledge and experience to the best advantage.

6. The prize in each case will be a silver cup or a cheque for £10.

7. The Committee on Awards will be—

The Minister of Water Supply.
The Director of Agriculture.
The Chairman of the State Rivers and Water Supply Commission.
And two others to be announced later.

The attached notice of intention to compete for these prizes should be filled in and forwarded to the Secretary of the Commission, Treasury Gardens, Melbourne.

NOTICE OF INTENTION TO COMPETE.

(*a*) Christian name and surname in full.

I, (*a*)

(*b*) Name of parish or name of Irrigation and Water Supply District.

of (*b*)

wish to be enrolled as a contestant for the prize in lucerne hay growing instituted by the State Rivers and Water Supply Commission in (*c*)

(*c*) Name of Irrigation and Water Supply District.

and do hereby agree to conform to all the rules and restrictions governing the said competition. Among others the following:—

(*d*) Situation of competing plot, giving number of allotment.

To seed not less than five acres, located as follows:—(*d*)

To stack the hay as required by the Commission and to leave it untouched until weighed or measured by the Committee on Awards.

To make a written report on a form, furnished by the Commission, of the dates of watering and cutting and the details of seeding and cultivation.

To the Secretary,
State Rivers and Water Supply
Commission, Melbourne.

(Signed)

Post Office—

Date—

CIDER MAKING.

J. Knight, Fruit Expert.

Cider is the pure juice of the apple and, in many parts of the world, is used as a beverage. In the county of Devonshire, few farmers are without their cider orchard; they take pride in the quality and quantity of their products. True Devonshire cider is recognised in most parts of the world, and justly so, but unfortunately it is not all good that is made there. In many cases proper skill and care are not bestowed upon it in its manufacture and after treatment, and no doubt, the same remark applies to other counties of England, such as Somerset and Herefordshire, where cider is extensively manufactured. Soil, climate, &c., determine to a great extent the character of this product, but skill and care are equally important factors in dealing with it.

Mr. J. M. Trowlbridge, who has written an excellent treatise on cider making in America, which is available in Victoria, makes a statement in his introduction, which is equally applicable to this State. He says:—"Good cider is a much greater rarity than good wine, which, all will admit, is scarce enough. Few Americans have ever tasted a perfect cider. This is a strange fact in a country so blessed as this with an abundance of apples, and where the general intelligence and inventive genius of the people are so great, and where all the necessary mechanical appliances have been brought to such high perfection and convenience that the older nations seek after and copy them; yet, with all these advantages three-fourths, yes, probably nine-tenths of all the cider made, is utterly spoiled, either in the process of making or immediately after becoming cider, and is totally unfit for human consumption as well as entirely unmerchantable."

It may be pointed out that the orchards of this State are unlike those in the old country, in that they are young and produce a much more succulent article than the old established orchards of Devonshire, Herefordshire, or Somerset, and we may add of Normandy and Britanny, the chief cider producing provinces of France, where the character of the various apples is known.

Until some system is adopted for ascertaining the chemical constituents of our product, I fear we shall not be able to produce cider of the same character, by adopting the treatment followed by the countries referred to.

In France, where it is said that the amount of cider manufactured equals half that of the wine, and is estimated at 620,211,200 gallons, cider making is conducted on the most scientific principles. In America also, cider is very largely manufactured, and has become a very popular beverage, and large quantities are exported to England.

Australia is equally favourable for the growth of apples for this purpose, but the climatic conditions are less favourable for its manufacture, and greater care is necessary in manipulating the juice. I am acquainted with the practice in Devonshire, and have seen the same system adopted in this State, but the result has not been as satisfactory as desired, and this is easily accounted for, as the high temperature experienced necessitates extreme care in all the various stages of fermentation and after treatment. Our temperature requires that cider should contain a much higher percentage of alcohol to give it the keeping qualities necessary for the ordinary cellarage provided here. Apples of the right class for cider making are not grown here and those that are available must be properly tested to give the best results. It must be borne in mind that Victorian orchards have

been planted for the purpose of supplying dessert and cooking fruit, and not for cider making. In treating these for cider making it is necessary to test each variety, and blend in such a manner as to get the proper conditions of sugar and acids.

The following table shows a number of varieties which have been tested for that purpose :—

COMPOSITION OF THE JUICE OF VARIOUS VICTORIAN GROWN APPLES TESTED FOR CIDER MAKING.

Name of Apple.	Grower.	District.	Per cent. of Juice.	Specific Gravity.	Possible Alcohol.	Acidity.
			%			
Rymer	Labour Colony	Leongatha ..	70	1.057	.7	.6
Scarlet Nonpariel ..	"	" ..	74	1.065	.8	.7
Reinette de Canada ..	"	" ..	84	1.068	1.50	.5
Cleopatra	"	" ..	73	1.060	7.25	.5
Rome Beauty	"	" ..	78	1.052	6.25	.4
Golden Russet	.. ..	Ferntree Gully ..	55	1.088	11.25	.8
Lord Wolseley	.. ..	" ..	56	1.068	8.50	7
Five Crown	.. ..	" ..	74	1.055	6.75	4
Munroe's Favourite ..	.. ..	" ..	69	1.069	8.50	.6
Morgan's Seedling ..	.. ..	" ..	75	1.050	6.	.4
Prince Bismarck ..	.. ..	" ..	75	1.055	6.75	.3
Statesman	Mr. Chandler	Bayswater ..	60	1.067	8.25	.6
Jonathan	Mr. Davis ..	Mooroopna ..	..	1.075	9.25	.6
Rome Beauty	" ..	" ..	..	1.073	9.00	.5
Cleopatra	" ..	" ..	..	1.070	8.75	.7
Five Crown	" ..	" ..	..	1.085	10.75	.4
Aromatic Cornish ..	Mr. W. G. Gray	Diamond Creek ..	61	1.080	10	.7
Dutch Mignonne ..	" ..	" ..	80	1.075	9.50	.7
Herefordshire Beefing ..	" ..	" ..	76	1.071	8.75	.4
Lady Henniker	" ..	" ..	75	1.070	8.75	.6
Leaver	" ..	" ..	72	1.064	7.75	.5
John Toon	" ..	" ..	74	1.067	8.25	.7
Blondin	" ..	" ..	75	1.065	8	.3
Rokewood	" ..	" ..	70	1.063	7.25	.6
Yates	" ..	" ..	78	1.065	8	.5
Cole's Rymer	" ..	" ..	75	1.067	8.25	.8
Draper's Best	" ..	" ..	72	1.067	8.25	.5
Buncombe	" ..	" ..	70	1.075	9.25	6
Striped Beefing ..	" ..	" ..	70	1.072	9	5
Sturmer Pippin ..	Labour Colony	Leongatha ..	70	1.055	6.75	6
Twenty Ounce	"	" ..	..	1.065	8	.5
Jonathan	"	" ..	68	1.055	6.75	.5
Melon	Mr. W. G. Gray	Diamond Creek ..	76	1.067	8.25	.6
Moss' Incomparable ..	"	" .	..	1.080	10.00	.6
Wagner	"	" ..	75	1.078	9.75	.5
Northern Spy	Mr. Spry ..	" .	76	1.070	8.75	.4
Scarlet Nonpariel ..	" ..	" .	70	1.074	9.25	.9
Newtown Pippin ..	" ..	" .	70	1.070	8.75	.6
Jonathan	" ..	" ..	78	1.080	10.00	.7
Kentucky Red Streak ..	" .	" ..	77	1.065	*8.00*	.7
French Crab	" .	" .	78	1.072	9.00	1.1
Stone Pippin	" ..	" ..	75	1.086	10.75	1.3
Rome Beauty	" ..	" .	75	1.081	10.25	.6
Yates	" ..	" .	80	1.076	9.50	.7
Ben Davis	" ..	" ..	75	1.083	10.50	.6
Shockley	" .	" ..	70	1.071	8.75	.6
Winter Majetin ..	Mr. W. G. Gray	" ..	60	1.061	7.50	.5
Red Afriston	" ..	" ..	73	1.085	10.75	.8
Pomme de Neige ..	" ..	" ..	..	1.064	8.75	.5
Dumelow's Seedling ..	" ..	" .	70	1.063	7.75	.8
Smith's Cider	" ..	" ..	72	1.064	7.75	.6
Cleopatra	" ..	" ..	68	1.051	6.75	.6
Hoover	" ..	" ..	65	1.061	7.50	.5
Five Crown	" ..	" ..	69	1.058	7.25	.5
Rymer	" ..	" .	70	1.056	7.00	.7
Sturmer Pippin (green) ..	" ..	" ..	72	1.056	7.00	.9
Morgan's Seedling ..	" ..	" ..	65	1.043	5.00	.4
Ribston Pippin	" ..	" ..	50	1.085	10.75	.5
Esopus Spitzenberg ..	" ..	" ..	..	1.070	8.75	.9
Reinette de Canada ..	" ..	" ..	..	1.063	7.75	.6
Munroe's Favourite ..	" ..	" ..	..	1.065	8.00	1.0
Sturmer Pippin (ripe) ..	" ..	" ..	73	1.065	8.00	.9
Stewart's Seedling ..	" ..	" ..	..	1.062	7.50	.9
Adams' Pearmain ..	" ..	" ..	..	1.071	8.75	.6

APPLES SUITABLE.

All apples are not equal in quality for cider making purposes; to say that cider cannot be made from all, may not be strictly correct, but it is to a large extent. What is required to make a good drinkable and keeping cider, is an apple containing various constituents, such as sugar, acids, &c., in such quantities that when fermentation is completed, the cider will not only be a good palatable article, but have natural keeping qualities as well.

The tendency in Great Britain and elsewhere is, however, to produce a cider which can be regarded as a semi-temperance drink, having a low percentage of alcohol, even below that of any of the cordials now recognised by temperance advocates, but this requires special treatment and appliances. No doubt it is a step in the right direction, and the object of producers should be to cater for the public taste.

Cider drinkers, as a rule, are wedded to hard or dry cider, which is altogether too tart and harsh for those unaccustomed to it.

TESTING APPLES BEFORE USE.

In order to avoid disappointment and loss, it would be well to carefully test the juice of all fruits before entering upon cider making. The method is simple and may be practised by any one with ordinary intelligence.

Secure a few (two or three) apples, a fair sample of those to be treated. Crush them in some small vessel or grate with a bread grater made of ordinary tin; place the pulp in a clean, strong, open cloth, and press out the juice into some dry vessel, which should be narrow and deep. In the absence of a test glass, an ordinary lamp glass with the bottom end stopped up with a cork, so as to avoid leakage, answers well. In this, place a cider maker's saccharometer which will register the amount of solids which the juice contains. The solids are regarded as sugar with a small percentage of about 1 per cent. of other matter, and it is from this that the strength of the cider is made. The greater the percentage of sugar, the greater will be the percentage of alcohol.

The list previously given shows how this generally runs. In taking this registration, care should be exercised to see that the temperature is about normal. Instruments of this class are generally made to register at a temperature of 60 degrees. It is important that all the tests should be made as near that point as possible, or the readings will not be correct.

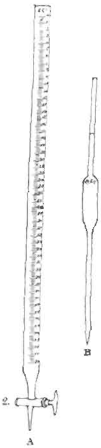
SACCHAROMETERS.

There are many of these instruments on the market, and they are made for different purposes, and the scale of each varies. It is advisable when going into cider making that a proper cider maker's saccharometer should be procured. The one recommended is "Lumley's," which gives the specific gravity, also a scale showing the amount of alcohol that it is possible to get from that, and at the same time classify the cider from its alcoholic strength. The instruments are inexpensive, and should be in the hands of every one dealing with apples, as it is of the utmost importance to know what is the strength of the juice before being dealt with.

So far this deals with the test of solids or sugar only, with a view of ascertaining the possible strength of alcohol, but there remains another test which is equally important in choosing apples for blending, and that is as to the right proportions of acid to give flavour and bouquet. Apples

deficient in acid give a tasteless and insipid cider and those with excess of acid are equally objectionable, and it frequently occurs that acid which is not easily detected by taste exists in fruits, and it is only persons acquainted with the business who can form any idea of its extent.

If we look at the analyses of the apples given, we find that the acid, like the saccharine matter, varies considerably; for instance, the "Stone Pippin" gives a possible alcoholic strength of 10.75, its acidity being 1.3 which is over twice that desirable, whilst the "Northern Spy" and others only contain .4 of acidity. Each one of these apples would, so far as saccharine matter is concerned, serve the purpose and make good cider, but the variation in the acidity would entirely destroy it.



1. SACCHAROMETER. 2. ACID TESTING APPLIANCES (A. BURETTE, B. PIPETTE.)

Now, if we desire to use the fruit to the best advantage we not only ascertain the amount of saccharine matter, but of acid also. The method adopted in ascertaining this is to apply some alkali, such as soda or potash, having an affinity for acid which, uniting with it, will combine and become neutral. The neutral point is ascertained by inserting a strip of blue litmus paper in the solution, or adding a few drops of phenolphthalein. If the paper reddens, the liquid is still acid, but if it remains blue, the liquid is alkaline. The neutral point is noted by a slight change in the colour of the paper, or where the phenolphthalein is used, the liquid under treatment turns red.

The alkaline solution should be made of such strength that one centimetre should neutralize one-tenth of 1 per cent. of acid, so that measuring off 10 c.c. of juice, with a small graduated pipette (which can be purchased for

2s. or 3s.) into a small vessel, and placing the alkaline solution into a burette *(which can also be obtained for a similar sum)* the solution can be let off as desired, and each c.c. of solution represents one-tenth of 1 per cent. of acid contained in the juice.

If the acid of the juice under test becomes neutralized with more or less alkali, the exact quantity can be computed, and the percentage of each ascertained, and by this means the must can be regulated in the quantity of acid as well as of saccharine matter.

The percentage of acid found to be best is six-tenths of 1 per cent. Apples will be found to contain various strengths and if it is desired to lower the standard, then juice can be found which is too weak of itself in either saccharine matter or acid and blended.

VARIATIONS IN SEASONS.

The necessity for carefully testing the strength of juice annually, is shown in the accompanying analyses, made by the distinguished chemist, Fresenius, who gives the result of the same variety of apples, for three successive years, showing how the season may vary their quality :—

	1853.	1854	1855.
Sugar	9.25	5.96	6.83
Acids	.53	0.39	.25
Water	86.03	82.03	82.04
Extractives	4.19	11.62	10.28

This is important, inasmuch as we are apt to look upon any one kind of apple as giving certain results under all conditions and where the variation *is to such an extent as given here, serious disappointment* may result, as the amount of alcohol would be insufficient to preserve the cider for any length of time.

SUGAR CONTENTS OF JUICE.

When a juice is considered below that which is desired in saccharine matter, it may be strengthened by the addition of sugar, but it is advisable *that none but the best crystallized be used for the purpose.* By testing small quantities of juice with the saccharometer the exact amount of sugar required can be ascertained.

When adding sugar, it should be dissolved in a portion of the juice to which it is to be added ; this should be heated to about 160 degrees Fahr., to dissolve the sugar, and then well stirred into the bulk to prevent the sugar lying at the bottom of the vat or cask. The sugar should be added prior to fermentation. It should be borne in mind that the alcohol is produced from the saccharine matter, and is, so to speak, the preservative, and when deficient, the cider will be defective in keeping qualities when kept in bulk, and in a climate like ours.

The amount of sugar to be added must depend on the amount contained in the juice ; about 1½ ozs. per gallon will raise the standard to 1 per cent., and for all practical purposes we may say that each 2 per cent. registered by the saccharometer will give 1 per cent. of alcohol.

It may be as well to note at this stage that, when the previous advice has been followed, and the original specific gravity recorded (on the end of the cask or elsewhere) the progress of the reduction of the sugar, which is the increase of alcohol, can be recorded from day to day.

The accompanying table was taken from a scientific treatise on cider making in the *Journal of Bath and West of England Association*, in which are published the most up-to-date investigations in cider.

TABLE SHOWING THE PERCENTAGE OF SUGAR AND ALCOHOL IN FERMENTING JUICE PROVIDED THE SPECIFIC GRAVITY OF THE ORIGINAL JUICE IS KNOWN.

(Present Gravity).

Original Gravity.	1065.		1060.		1055.		1050.		1045.		1040.		1035.	
	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.
1050 ..	..	..	..	..	..	..	10.5	0.0	9.3	.6	8.1	1.2	6.9	1.8
1051 ..	..	..	..	..	..	..	10.5	.1	9.3	.7	8.1	1.3	6.9	1.9
1052 ..	..	..	..	..	..	..	10.5	.2	9.3	.8	8.1	1.4	6.9	2.0
1053 ..	..	..	..	..	..	..	10.5	.3	9.3	.9	8.1	1.5	6.9	2.1
1054 ..	..	..	..	..	..	..	10.5	.4	9.3	1.0	8.1	1.6	6.9	2.2
1055 ..	..	..	..	..	*11.5*	*.0*	*10.5*	*.5*	*9.3*	*1.1*	*8.1*	*1.7*	*6.9*	*2.3*
1056 ..	..	..	..	..	11.5	.1	10.5	.6	9.3	1.2	8.1	1.8	6.9	2.4
1057 ..	..	..	..	..	11.5	.2	10.5	.7	9.3	1.3	8.1	1.9	6.9	2.5
1058 ..	..	..	..	..	11.5	.3	10.5	.8	9.3	1.4	8.1	2.0	6.9	2.6
1059 ..	..	..	..	..	11.5	.4	10.5	.9	9.3	1.5	8.1	2.1	6.9	2.7
1060 ..	..	..	12.5	.0	11.5	.5	10.5	1.0	9.3	1.6	8.1	2.2	6.9	2.8
1061 ..	..	..	12.6	.1	11.6	.6	10.6	1.1	9.4	1.7	8.2	2.3	7.0	2.9
1062 ..	..	..	12.7	.2	11.7	.7	10.7	1.2	9.5	1.8	8.3	2.4	7.1	3.0
1063 ..	..	..	12.8	.3	11.8	.8	10.8	1.3	9.6	1.9	8.4	2.5	7.2	3.1
1064 ..	..	..	*12.9*	*.4*	*11.9*	*.9*	*10.9*	*1.4*	*9.7*	*2.0*	*8.5*	*2.6*	*7.3*	*3.2*
1065 ..	14.0	.0	13.0	.5	12.0	1.0	11.0	1.5	9.8	2.1	8.6	2.7	7.4	3.3

Original Gravity.	*1030.*		*1025.*		*1020.*		*1015.*		*1010.*		*1005.*		*1000.*	
	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.	Sugar.	Alcohol.
1050 ..	5.7	2.4	4.7	3.0	3.8	3.5	2.9	4.0	2.0	4.5	1.1	5.0	.2	5.5
1051 ..	5.7	2.5	4.7	3.1	3.8	3.6	2.9	4.1	2.0	4.6	1.1	5.1	.2	5.6
1052 ..	5.7	2.6	4.7	3.2	3.8	3.7	2.9	4.2	2.0	4.7	1.1	5.2	.2	5.7
1053 ..	5.7	2.7	4.7	3.3	3.8	3.8	2.9	4.3	2.0	4.8	1.1	5.3	.2	5.8
1054 ..	5.7	2.8	4.7	3.4	3.8	3.9	2.9	4.4	2.0	4.9	1.1	5.4	.2	5.9
1055 ..	5.7	2.9	4.7	3.5	3.8	4.0	2.9	4.5	2.0	5.0	1.1	5.5	.2	6.0
1056 ..	5.7	3.0	4.7	3.6	3.8	4.1	2.9	4.6	2.0	5.1	1.1	5.6	.2	6.1
1057 ..	5.7	3.1	4.7	3.7	3.8	4.2	2.9	4.7	2.0	5.2	1.1	5.7	.2	6.2
1058 ..	5.7	3.2	4.7	3.8	3.8	4.3	2.9	4.8	2.0	5.3	1.1	5.8	.2	6.3
1059 ..	5.7	3.3	4.7	3.9	3.8	4.4	2.9	4.9	2.0	5.4	1.1	5.9	.2	6.4
1060 ..	5.7	3.4	4.7	4.0	3.8	4.5	2.9	5.0	2.0	5.5	1.1	6.0	.2	6.5
1061 ..	5.8	3.5	4.8	4.1	3.9	4.6	3.0	5.1	2.1	5.6	1.2	6.1	.3	6.6
1062 ..	5.9	3.6	4.9	4.2	4.0	4.7	3.1	5.2	2.2	5.7	1.3	6.2	.4	6.7
1063 ..	6.0	3.7	5.0	4.3	4.1	4.8	3.2	5.3	2.3	5.8	1.4	6.3	.5	6.8
1064 ..	6.1	3.8	5.1	4.4	4.2	4.9	3.3	5.4	2.4	5.9	1.5	6.4	.6	6.9
1065 ..	6.2	3.9	5.2	4.5	4.3	5.0	3.4	5.5	2.5	6.0	1.6	6.5	.7	7.0

By this it will be seen that each day's reduction, or result of fermentation, can be noted, and where it is thought desirable to stop fermentation, the juice may be thoroughly filtered and put by in a cask or bottle. When making cider in this State, where the taste for cider drinking has to be cultivated, it is well to retain a fair amount of the sugars, say, 2, 3, or 4 per cent. Where the juice has been properly treated and thoroughly filtered, it may then be safely bottled. I desire to emphasize the fact that unless it is thoroughly filtered, so as to remove all foreign matter, there will be danger of excessive fermentation setting in and bursting the bottles. If the bottles are put in a cool place, a silent fermentation will set in and give that much desired effervescence generally known as sparkling.

Where fermentation is carried out until the whole of the sugars are reduced, which is known as hard or dry cider, no silent fermentation will take place, and the cider is known then as "still" cider, and the natural acids of the fruit are laid bare, consequently those unaccustomed to cider drinking do not appreciate the taste. If each test is recorded, it will be a simple matter to get the percentage of alcohol and sugar also; the acids may reduce slightly, but scarcely to any perceptible degree.

By the following tables, the progress of fermentation of two casks of cider made from apples selected from the list given previously, will be seen.

PROGRESS OF FERMENTATION IN CASK NO. 1, SEASON 1905.

Date.	Specific Gravity.	Alcohol.	Sugar.	Acidity.	Remarks.
8 May	1.065	..	14.0	.5	
9 ,, ...	1.060	.5	13.0	.5	
11 ,, ...	1.057	1.1	11.8	.5	
12 ,, ...	1.052	1.4	11.3	.5	
13 ,, ...	1.050	1.5	11.0	.5	
15 ,, ...	1.048	2.8	10.5	.5	Filtered (Invicta)
16 ,, ...	1.043	2.3	9.8	.5	
17 ,, ...	1.042	2.5	9.3	.5	
18 ,, ...	1.042	2.5	9.3	.5	
22 ,, ...	1.041	2.6	9.0	.5	
25 ,, ...	1.040	2.7	8.9	.5	Filtered
30 ,, ...	1.037	2.8	8.6	.5	Filtered, Bottled

PROGRESS OF FERMENTATION IN CASK NO. 2, SEASON 1905.

Date.	Specific Gravity.	Alcohol.	Sugar.	Acidity.	Remarks.
5 May	1.077	..	17.2	.6	
8 ,, ...	1.067	1.2	15.2	.6	
9 ,, ...	1.061	1.7	14.7	.6	
10 ,, ...	1.056	2.2	13.2	.6	
11 ,, ...	1.053	2.4	13.0	.6	
12 ,, ...	1.050	2.7	12.2	.6	
13 ,, ...	1.047	3.0	11.5	.6	Racked
15 ,, ...	1.040	3.9	9.8	.6	
16 ,, ...	1.037	4.2	9.0	.6	
17 ,, ...	1.035	4.5	8.6	.6	Filtered (Invicta)
18 ,, ...	1.031	5.0	7.8	.5	
20 ,, ...	1.030	5.2	7.4	.5	
25 ,, ...	1.030	5.2	7.4	.5	
30 ,, ...	1.030	5.2	7.4	.5	
31 ,, ...	1.030	5.2	7.4	.5	Bottled

Cask No. 1 was filled on the 8th May, 1905, and the specific gravity was given as 1.065 which gave 14 of sugar and .5 of acids. Tests were made on the other dates specified and the results are given in each case. It will be noticed that in No. 1 there was 2.8 of alcohol and a large per cent. of sugar, 8.6, but the stoppage of fermentation was due to the filtering.

The cider was of excellent quality and kept well; whereas if it had not been filtered to the extent to which it was, there is no doubt much loss

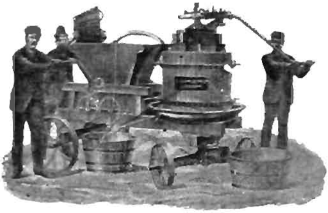
would have resulted. Filtering under pressure is a very important matter in cider making, especially in this State, where the temperature varies more than it does in the old country.

GATHERING THE APPLES.

In gathering apples for cider making, it is necessary to be exceedingly careful that the fruit is properly matured, as the principal constituent *(saccharine) for cider making, is deficient in unripe fruit. The following* analyses, made by direction of a French Agricultural Society, show the importance of this point:—

	Green.		Ripe.		Over-ripe or spoiled
Water	85.50	...	83.20	...	63.55
Saccharine matter	4.90	...	11.00	...	7.95
Cellular tissue ..	5.00	.	3.00	...	2.00
Gum	4.01	..	2.11	.	2.00
Albumen	.10	...	.50	...	.00
Acids, oils and other matters	.49	...	.50	...	·60
	100.00	..	100.31	...	76.10

The apples should be gathered carefully and placed in heaps under the trees, in sheds, or house to ripen and mellow; in many cases straw or hay is spread under the trees so as to break the fall and prevent bruising. They should not on any account be allowed to lie on the earth, as they become earthy to the taste and impart a disagreeable flavour to the cider. This also applies to musty straw or other matter giving off an odour of any kind, but it is safe to use wood, stone, or cement.



3. PORTABLE CIDER MILL.

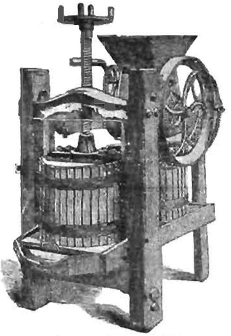
In stacking, each variety should be kept separate and as they mature they are carefully mixed, according to the constituents. When cider is required for long keeping, apples having an astringent flavour are mixed in freely, about two to one of the sweeter kinds; but when cider is made for early use, less of the latter is required. The astringency is attributable to the tannic acid which is desirable in cider when required for long keeping.

Mr. Trowlbridge recommends the use of sheets, or "blankets" as they are termed, spread under the tree, and supported on the outside edges by stakes lightly driven, and tied-up with cords, thus breaking the fall of the fruit, and preventing bruising and soiling with animal and other dirt. As the apples may have to be kept for some time to mellow and ripen it is advisable to avoid bruising as much as possible. Rotten apples should be scrupulously avoided.

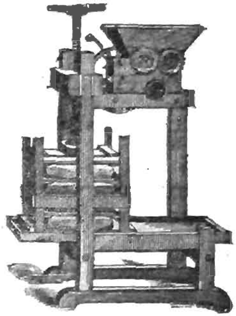
MACHINERY FOR CIDER MAKING.

Perhaps the most useful and convenient mill is the one illustrated here. (Illustration No. 3.) It is some four or five years ago since the Department introduced this mill, together with all the latest appliances for producing good cider. As will be seen, it is mounted for travelling, and this makes it extremely convenient as it can be shifted about from orchard to orchard. The grinding portion of this machine is capable of treating 8 to 10 tons per day, but the press is limited in its capacity and cannot treat more than 2 tons per day. Since it was introduced, local makers are making a similar mill which is quite equal to it. The carriage portion is not necessary where the mill is required for one's own use.

The cost of the plant, mill, press, and carriage, in England is about £35, whilst the locally made mill, without carriage or press, runs to £15 or £16. The stone rollers which grind the pulp are slightly larger than those of the imported one, and appear to give satisfaction. So far as the press is concerned, any kind is suitable. Many of the wine presses which were so plentiful in this State, are being purchased for this purpose.



4. SMALL CIDER MILL.



5. SMALL CIDER MILL SHOWING PRESS WITH RACKS AND CLOTH.

There are smaller mills of different type and makes, as shown in the accompanying illustration (No. 4). The Department has one of these also, and for small quantities it works fairly well. They are obtainable in the State.

PRESSING.

In working the press, it is necessary to make some provision to confine the pulp, and also for the escape of the juice from the centre of it when under pressure.

The old method was to build up alternative layers of straw and pulp, thus keeping the mass compact, and at the same time allowing the juice to pass out from the centre, but this has given place to a much more convenient and better method (see No. 5). A rack covered with strong cloth is now used. The rack is made of strips of wood, half-inch or three-quarters square, with cross pieces as shown in illustrations Nos. 5 and 6.

A frame consisting of boards strongly put together, and made convenient to handle, is laid on the rack, and the cloth spread over it (No. 7). The pulp is then spread in to the depth of the frame, which is about 4 inches, and the edges of the cloth are turned in as shown in No. 8.

6. FORM OF RACK.

7. FRAME PLACED ON RACK.

There are different methods of folding the cloth, but those illustrated are most usually adopted. The frame is then removed and another rack laid on, this process being repeated until sufficient layers are obtained to fill the press. The advantages of this system are not only in its convenience for working, but in its improved method for retaining much of the mucilage which passed out under the old system.

8. METHOD OF FOLDING CLOTH.

When suitable cloth is used, it acts as a strainer and prevents the mucilage from flowing away with the juice, and giving trouble in the after treatment. There were formerly various grades of cloth in use, haircloth and also a coarse kind of worsted, but cotton is now almost universally employed, and is known as cotton press cloth.

9. A CONVENIENT PRESS.

Illustration No. 9 shows the type of press which was imported with the cider mill introduced by the Department. This is the usual class of press now found in most of the wine cellars in the State. For convenience, it is mounted on wheels and fitted with metal troughs all round to collect the juice and deliver it to a given point. This press is very convenient, and can be worked or packed away in a small space.

FILTERING THE JUICE.

As the apple juice when leaving the press is not in a fit state to pass on to the fermentation vat or cask, it is usual to run it through a strainer of some kind, and various appliances are employed for this purpose.

Where only a small quantity has to be filtered, the juice is allowed to trickle through a small tub perforated at the bottom and filled in to about 3 or 4 inches with clean cotton wadding with a few clean pebbles on the top to keep it compact; this serves as a funnel when filling the cask. The cask is then stored away into some place where the temperature can be kept evenly, when fermentation will go on steadily.

Some French authorities advocate the heating of the freshly pressed juice to a temperature of 160 degrees Fahr., or thereabouts, and keeping it at this temperature for about two hours, the object being to assist in converting into saccharine matter certain of the solids which otherwise would remain undeveloped, but many maintain that by this system there is a dried fruity taste imparted. Brannt, in his excellent work on "*Vinegar and Acetates*," shows how this defect has been overcome, and speaks highly of the system.

10. FILTERING JUICE.

The heating, if practised, should be done carefully, and on no account must the juice be brought into contact with iron; the best method is to pass moderately heated steam through a coil made of block tin, placed in the bottom of the vat or cask, and to gradually bring the juice to the desired temperature.

As the heating is done prior to fermentation, the necessary ferment germ will probably be destroyed, and in order to replace this a small portion of the fresh unscalded juice should be added when the temperature has been reduced to below 100 degrees Fahr. If care be taken in the selection of this juice, the character of the bulk may be improved.

FERMENTATION.

Fermentation is one of nature's methods of effecting a change in the character of various substances. Pasteur has shown us that the various ferments can be worked under perfect control and may be regulated at will. When dealing with perishable substances, such as fruit juice, fermentation will soon cause serious injury unless kept under control and properly directed.

J. M. Trowlbridge, in his "*Cider Manual*," states:—"There are three successive stages of fermentation, known severally as the vinous, the acetous, and the putrid, and it should not be forgotten that all fermentation is decay. The vinous fermentation is no exception; it is only

the beginning, and if it be not checked at the proper stage, the next stage will follow immediately. That next stage is the acetous (vinegar) stage, into which nearly all cider, and no small amount of ill-made or weak wine, passes. After that comes the putrid stage, in which the vinegar is destroyed, and nothing but corruption remains. Sometimes, though rarely, these successive stages manifestly go on simultaneously, or at least overlap and pass on from one to the other, as to loose all distinctive stages."

Thus we see that the first to act is the vinous fermentation which reduces the saccharine matter to alcohol, and care should be taken to arrest its progress when it has made sufficient advancement. At this stage there should be sufficient alcohol to preserve the cider, and if the juice has shown not less than 14 per cent. of solids, prior to fermentation, there will be 12 to 13 per cent. of saccharine matter, and about 1 per cent. ot other solids. This will yield about 6 per cent. of alcohol, which is the minimum amount for preserving the liquid, and unless extreme care is taken to prevent acetic fermentation setting in, it will soon destroy the already too limited amount of alcohol.

There is no part of this business which requires more care; in a climate like ours where the temperature rises to a high degree, the fermentation is very rapid, and special skill and care are necessary to avoid loss from this cause. In Devonshire the juice is run into casks, set aside in some cool chamber, and fermentation allowed to proceed slowly. When sufficiently reduced, it is checked by being racked off before the saccharine matter is exhausted, and this frequently has to be done three or four times before it becomes still. In England and other countries, experience alone guides the operator, and at a glance he is enabled to see if anything is wrong, and knows how to apply the remedy.

It is admitted that the conditions of cider making are vastly different in this climate to what they are in that of England, and manufacturers here should recognise this fact and act accordingly. Making cider under conditions frequently seen in this State is nothing short of folly. Open sheds and outhouses, without any means of regulating the temperature, are often used; one day the thermometer is at 100 degrees or over, and possible down to 50 or 60 degrees in a few hours.

Under such conditions it is utterly impossible to produce a good cider. The limits of temperature in which the cider should be fermented range from 60 to 90 degrees Fahr., but it must not be understood to mean that the range of temperature during fermentation should vary between these points; it should be kept as even as possible, not varying over 5 degrees. For example, if fermentation is to be carried on at a high temperature, say 85 or so, it should be kept to that as near as possible, and should not vary more than 2 or 3 degrees above or below, and where the register of saccharine matter is low, as it usually is with apple juice, the lower the temperature the better, providing it is within the range given. It should be borne in mind that the change from vinous to acetous fermentation is much more rapid in weak juice than in strong.

A frequent and careful test with thermometer and saccharometer is necessary at this stage. A gradual rise in temperature within the vat or cask during the early stage of fermentation will probably be experienced; but as the saccharine matter becomes exhausted, the temperature will recede to nearly that of the room and when the saccharometer denotes that the specific gravity has been reduced to the lowest point, the cider should be immediately racked off, and allowed to cool down to check further fermentation.

In each operation care must be taken to avoid exposing the cider to the atmosphere, as it absorbs oxygen and acidifies rapidly. At every stage the air should be excluded as much as possible.

ARTIFICIAL FERMENTS.

The cultivation of ferments or yeast is now practised largely and many assert that considerable advantage may be derived from their use. Mr. De Bavay, who interests himself in such matters, has, I am informed, imported from France some of the latest ferments in use in that country, and is prepared to distribute them in a similar manner to the wine levures which have given such good results in wine at the Dookie College and elsewhere. Full instructions are sent with each lot, and their application is simple in the extreme. By the action of these ferments, the natural fermentation is superseded, and as the character of the liquid partakes much of the character of the yeast employed, it should be of service in helping to produce a proper article.

Mr. De Bavay informs me that the sterilizing of the juice is unnecessary. The ferments are supplied in hermetically sealed bottles, and all that is necessary is to open the bottle and fill it with a portion of the liquid, when the ferment is started into life, and ready for immediate use.

CLASS OF CIDER.

The cider generally met with in this State, has, until recently, been such as would not recommend itself to the cider drinker. It showed defects in the manipulation, but fortunately there were exceptions here and there which proved what could be done by proper treatment; and this leads us to inquire what is the proper class of cider to produce. Many who were well acquainted with the industry in England find that something more than that which they have been accustomed to, is required, and adopt means to supply that want.

To produce a suitable article, much care and skill are necessary; many try, and fail, and the article so produced is unfortunately placed on the market, and disgusts those who may be induced to try it. We cannot do better than look carefully into the cause of the failure, and try and apply a remedy.

We have already pointed out that the first step is to test the various kinds of apples which we have to treat, and ascertain their character. Then the chemical changes which occur in the juice during fermentation, must take place under such conditions as will enable the operator to regulate the temperature at will, and he must also adopt a thorough system of cleanliness. Crusher, presser, vats, and all articles brought into contact with the apple juice, must be carefully washed with an alkaline solution after use. The cellar itself should be carefully dusted with lime to neutralize any acid germs which may have been encouraged by juice or any other particles which may be scattered about. Where these conditions are complied with, cider may be produced which would be sought after, whether it is still or sparkling, dry or sweet.

The production of these different classes of cider is a matter of importance, and it is during the stage of fermentation that the character is given them. Hard or dry cider is that produced where all the sugar has been exhausted, or converted into alcohol. No further vinous fermentation can then take place, and the liquid remains still; this is what is understood by "still" cider, there being no sugar to create carbonic acid gas, which causes the ebullition known as sparkling.

Sweet cider is that in which the fermentation has been stopped before the whole of the sugar has been changed. These natural sugars cover up the acids, and give the cider a softness which is generally appreciated by those unaccustomed to cider drinking. Sweet cider requires much more care in its after treatment than dry, as the saccharine matter tends to assist in the development of undesirable tendencies after fermentation, but with proper care and treatment this can be overcome. What is required is to remove all foreign matter contained in the liquid, and this is best accomplished by filtration. From the sugar remaining carbonic acid gas is created, and gives the sparkling effect so much sought after by many.

Still cider is sometimes treated, when bottling, by the liquid being charged with carbonic acid gas, similarly to our aerated waters, and this system is now becoming popular in some cider making countries. By this means the maximum amount of alcohol is obtained, as the sugars are all converted into spirits, thus giving the cider strength and keeping quality.

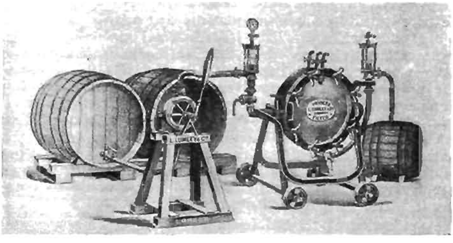
As to the proper stage in which fermentation should be arrested, much depends on the class of article required.

CLARIFYING.

The object in clarifying is to remove all floating matter, clear the liquid, and remove all organisms which encourage undesirable fermentation, thereby giving a clean, bright appearance. This object is obtained by two methods, one by dissolving pure albuminous matter in a portion of the liquid and stirring it through the bulk, the other by filtration. There are many clarifying agents used, and some are specially prepared for the trade, but those mostly employed are pure isinglass and white of egg. A certain French clay is highly spoken of. Isinglass is expensive, but only a small quantity is required, half an ounce being generally considered sufficient for a 100 gallon cask; the difficulty is to get the pure article.

FILTERING.

In the filtering of all alcoholic liquors, it is important that they should be kept from exposure to the atmosphere, more especially those liquors weak in alcohol, as the oxygen in the air tends to destroy the alcohol by



11. FILTERING CIDER—THE INVICTA FILTER.

setting up an acetous fermentation. For all such liquors which it is intended to store, and especially those light in alcohol, it is important that any matter not perfectly soluble, should be eliminated. This is most effectually done by the appliances shown in the accompanying illustrations.

There are many classes of filters in use, but no doubt the one most approved for large quantities is that known as the "Invicta" (No. 11), and when cider making is entered upon on a large scale, it is advisable to procure this filter. The Department imported one of these with its cider plant, the price being £85 in London. For small growers it is expensive, but when co-operation is adopted, and that system of treating the products of the orchard cannot be too strongly impressed upon growers, it will then be found possible and desirable to obtain this and other modern appliances.

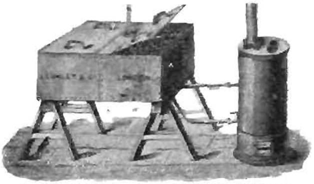
Other less expensive filters are available, and will be found to meet the requirements of small growers. Messrs. Doudey and Testro, of South Melbourne, have perfected a filter (No. 12) which will serve the purpose for small or large makers admirably. It has been subjected to a severe test, both in fermented ciders and in unfermented juice, and I have no hesitation in stating that it will meet all requirements at half the cost of the above.

12. MESSRS. DONDEY AND TESTRO'S FILTER.

PASTEURIZING.

This term is given in honour of the eminent French scientist, Pasteur, and his system appears to be well adapted to light liquors, such as cider, which have a tendency, when the slightest cause is given, to pass on from the vinous to the acetous fermentation.

Pasteurizing consists of raising the temperature of the liquid after fermentation from 140 to 160 degrees Fahr., keeping it within these limits for a given time, say, two hours, restricting its duration at the highest point for a very few minutes, and scrupulously guarding against allowing the air to come into contact with it after this treatment.

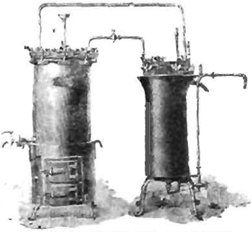


13. PASTEURIZER FOR BOTTLED LIQUIDS.

The simplest and most general plan is that adopted and recommended by the English cider makers. The accompanying illustration (No. 13) shows the appliances employed. These are made by the firm of L. Lumley and Company, London.

When large quantities are being treated, the other design (No. 14) may be of more advantage, but the cost is much greater.

For treating large quantities in bulk, such as in barrels, it is recommended that they be placed in a closed in room, and the temperature raised until the heat has permeated the contents of the cask to the desired degree. It may be kept at that (about 150 degrees Fahr.) for several hours without detriment. The thermometer should be inserted in a small hole made in the bung, in order to register the inner portion of the contents of the cask, care being taken that the air is not allowed to enter or the alcohol to escape. If the thermometer is permanently fixed in one average cask, it will suffice for the lot. The chamber is then allowed to cool down, as quickly as possible. Wet cloths are placed on the casks, and any other means adopted that may be convenient.



14. PASTEURIZER FOR TREATING LARGE QUANTITIES.

Smaller quantities may be treated in bottles in the following manner :—The cider should be well filtered and placed in clean strong bottles, care being taken to allow room for the liquid to expand ; the bottles are then tightly corked, and the corks securely tied down. The bottles are placed in a boiler ; the latter is filled with cold water to the neck of the bottles and heated up to 140 degrees, then gradually to 160 degrees and kept within the range of 140 to 160 degrees for fifteen or twenty minutes. As before stated the cider should remain at the highest temperature for a short time only, five minutes being sufficient.

Pasteurizing is not universally adopted by cider makers, and with some it finds no favour, but it is worthy of a trial. Trowlbridge says :—"Juices in their various fermentations taking unfavourable tendencies, and young wines assuming a prejudicial quality, are at once put to shelter from any further untoward action, and in some cases where damage has actually occurred, are restored to a sound and agreeable condition by the process. Juices starting in an unsound fermentation, pasteurized and filtered, can be used with new juices in a new and sound fermentation, and thus be saved from the utter destruction which would otherwise be certain to follow."

TEMPERANCE CIDER.

There is another very important branch that has not been touched upon in the foregoing treatise, namely, non-alcoholic cider. Experiments have been conducted by me during the last four of five years in this direction. The extreme simplicity of making the pure non-alcoholic cider is such that I cannot but refer to it, as I feel certain that there is an immense future for this class of beverage in a climate similar to that of the Commonwealth.

The preceding instructions for the making of alcoholic cider apply equally so to the non-alcoholic cider, up to a point, with this difference in its favour, that apples with a low percentage of sugars, which would be undesirable in the alcoholic ciders, also apples that are high in acidity, can be used for this purpose indiscriminately. The crushing and pressing are the same in all respects as that previously described. On leaving the press it is filtered till it is clear ; if one filtering is not sufficient, then again and again. This will depend on the class of filter used ; with a pressure filter it is sometimes found that it can be done with one filtering, but I prefer a lighter pressure and twice through. It should be passed through

before any fermentation takes place, say 24 hours after being crushed; it may then stand, if desired, for another 12 or 24 hours, but in no case should fermentation be allowed to take place.

It is filtered and bottled, corked and wired down tightly. The bottles must be strong and sound, and the corks good fitting, tight, and well wired down. They are then placed in the pasteurizer, illustrations of which have been given, brought gradually to a temperature of 140, and from that gradually up to 150. It should be kept at and between these temperatures for an hour, then allowed to go up to 155 for another half-hour, and for not exceeding five minutes, up to 160, when it should be brought back, by the addition of cold water, to 150, and allowed to remain at about 145 to 150 degrees, making about two hours in the heated water. The bottles may then be taken out, care being taken to avoid draught which may affect the glass, and the process is completed.

Cider so treated has been made and stored at my office between four and five years, and is perfectly sound, and as good as the day it was made.

This system of treating ciders, which applies to the juice of the apple, also applies to the juice of the pear, or any other fruit juice, but to make a pleasant beverage, it must be well filtered. The drawback to the system is the quantity of bottles required to carry on in a large way. Small bottles are usually employed, but large bottles may be used where there is a fair amount consumed, as a bottle when opened will keep without deterioration for 24 or 48 hours, according to the temperature that it is kept in, before any fermentation sets up.

Experiments in small kegs have also been carried on, and there is no reason why large casks should not be employed, but the difficulty is in sterilizing it in bulk quantities. Where it is desirable to carry it out on a large scale, a small chamber similar to a drying kiln, may be erected, in which the air can be kept at a regular temperature for a considerable time, so as to raise the heat in the centre of the bulk to the temperature described. If that is done whilst being corked or bunged down tightly, and made airtight, the material will keep in bulk as well as in bottle.

I am basing this statement on an experiment made with a 5-gallon keg, which has now been standing for twelve months. It is fitted up so as to show the slightest sign of movement in the inside, and where this system of treating in bulk is practised, it would be advisable to adopt something similar. It is a well known practice with wine makers, and it indicates when the fermentation has ceased. The appliance consists of a tube, a glass tube for preference, fitted into the bung of the cask on one end and a bottle filled with water on the other, and should fermentation take place, the ebullition will be noticed; such has not taken place in the instance I have given.

Where it is thought desirable to have a slight amount of alcohol, say half of 1 per cent., or even what is allowed by law for temperance drinks, such as ginger beer, 2 per cent., that can be done by allowing a slight fermentation to take place either in the bottling when corked down, or in the juice before corking down. The former is preferable, but I may say here that some of the temperance advocates object to the slightest amount of alcohol. In making cider from time to time, I have tried .5 and also .8 of alcohol which is extremely low, but some object, so it is as well to know that it can be done without any alcohol accumulating whatever.

It is pleasing to note that one of the cordial manufacturers in Melbourne has taken this matter up and purposes dealing with it in various forms, such as aerating artificially, and also by natural fermentation. I trust he will

have success; but for general use the simple method just described, answers all purposes.

SULPHURIZING.

This system of destroying and preventing fungoid growth is an old and safe one. Although many antiseptics have been introduced none appear to be so generally used as this, but the clumsy way in which it is applied, sometimes leads to disagreeable results. Where sulphur is allowed to drop about in casks, and become mixed up with the cider, it cannot fail to have an injurious effect; when sulphur fumes are applied, the sulphur should be burned on the outside of the cask, and the fumes led in by a pipe.

15. FUMIGATOR.

A simple contrivance (No. 15) has been designed by Mr. Federli, wine expert at Dookie Agricultural College. It is made by Messrs. Doudey and Testro of South Melbourne, and works well, but any method which allows the sulphur to be burned and the fumes to be disseminated in the casks, will answer the purpose. Any small tin which will pass through the bung hole and have sufficient depth to hold a few embers, so as to burn a teaspoonful or two of sulphur, will serve much better than the ordinary sulphured ribbons, as they are termed, which are simply narrow strips of calico with brimstone and which are suspended from the bung hole and burned within the cask.

The process of sulphurizing is frequently employed for preventing undesirable fermentation, but Pasteur's system of heating which has been described, is undoubtedly preferable.

Sulphurizing empty casks to prevent them becoming mouldy and musty is no doubt a good practice, but the cask so treated should be well washed before being filled again with cider.

Fumigating the cellars occasionally is a good practice, as fungoid germs lodge in all manner of places, and can be destroyed more effectually by this means than by any other.

A liberal supply of whitewash and sulphur goes far to prevent trouble where fruit juices are stored.

TREATMENT OF CASKS.

The treatment of casks, whether new or old, is of very great importance for no matter how carefully the various operations may have been previously carried out, the cider will be spoiled, or seriously damaged, if put into casks not properly prepared.

If not previously treated, new casks will impart a strong woody flavour to their contents. There are various methods of preparing casks, but where steam is available, a jet turned on through the bung hole for a short time will extract all tannin and enter crevices or joints more effectually than any other means.

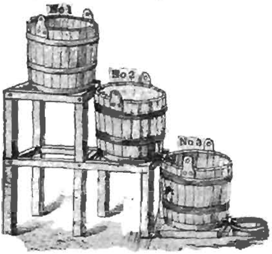
Another plan is to fill the cask with water, adding a small amount of lime which neutralizes the tannic acid; after soaking for a few days the cask should be emptied, then refilled with water to which a little salt has been added, and allowed to stand for a day or so; it should then be rinsed and re-filled with clean water, and after soaking for a few hours the cask may be used.

Old casks are more difficult to deal with, but steam is one of the best remedies. If the mould be deep seated a strong solution of caustic potash may be used. Whilst boiling hot, pour into the cask five or six gallons of this solution, strong enough to float an egg; roll the cask well and stand it alternately on each end so that the solution will gain access to all parts; let it soak for a time, then fill with water leaving a gallon or two of solution in the cask. Let it stand for a day or two and then empty and rinse with two or three waters. It is risky to use old casks, and where the mould has penetrated the wood it is better to discard them. A solution of potash should be kept at all times where cider is made, and vessels, crusher, press cloths, and tools of all kinds, washed frequently with it. A liberal distribution of lime is also an excellent preventative against fungoid and insect life.

The cellar for storage of casks, whether full or empty, should be free of all disagreeable odours; where dampness exists, they are difficult to prevent, but this defect must be remedied. Good wholesome air with an even temperature ranging between 50 and 60 degrees, lower if possible, is what should be aimed at where cider is stored.

DIFFUSION IN CIDER MAKING.

Cider is sometimes made by a system known as diffusion, similar to the most improved method of extracting the juice from the sugar beet. There are various methods adopted in carrying this out, but a French gentleman named Mr. Jules Nanot, of Paris, has adopted a simple, effectual, and inexpensive method by which small quantities of cider can be made where there is no machinery available for treating the fruit otherwise.



16. ARRANGEMENT OF TUBS.

The illustration (No. 16) shows his method, and although it appears somewhat complicated at the start, it is simple in the extreme when once practised.

The following is his description of the method :—

Suppose we take 150 kilogrammes (about 3 cwt.) of apples reduced to pulp. Divide them into three lots of 50 kilogrammes (about 1 cwt.) each, and put each lot into a vat or tub. These tubs are then placed in steps one above the other, and communicate with each other by means of spigots provided in the interior with small convex screens.

Care must be taken to keep the tubs closely covered, not only to prevent the pulp from floating, but also to prevent oxidation, as otherwise, on account of the mass remaining exposed to the air for a long time (three times 24 hours) it would yield cider which afterwards would turn black.

First manipulation :—Pour 50 litres (about 11 gallons) of water into tub No. 1 and macerate for 24 hours.

Second manipulation :—Draw off the liquid in No. 1 by opening the spigot into No. 2, and pour again 50 litres of water into No. 1 and macerate for 24 hours.

Third manipulation :—Draw off the liquid from No. 2 into No. 3, and the liquid from No. 1 into No. 2. Pour 50 litres into No. 1 and macerate for 24 hours.

Fourth manipulation :—Draw off the liquids from No. 3, then draw off the liquid from No. 2 into No. 3, and from No. 1 into No. 2. Now remove No. 1 and replace its exhausted pulp with freshly ground apples, then instead of putting it on the top step, place it at the bottom, and shift Nos. 2 and 3 one step higher up so that No. 2 becomes No. 1, No. 3, 2, and No. 1, 3; then draw off the liquid in No. 2 into No. 3 and that of No. 1 into No. 2; now pour 50 litres of water into the upper tub No. 1, and repeat this every 24 hours during the process. The liquid, which is drawn off every 24 hours from the lowest tub, is poured into the barrel in which it is to ferment."

The water is first applied to the partly exhausted pulp and passed from there to the next stage, and finally on to the fresh pulp, and thence into the cask. Where carried out on a large scale, the vats are placed on the ground, and the liquid pumped from one cask to the other; then any number of tubs may be employed.

The juice is then tested with the saccharometer to ascertain its density, and if less than 10 or 12 per cent., sugar is added to bring it up to the desired strength. If the cider is required for early use, less sugar is needed than if required to stand over for a year or two. The juice is then treated similarly to that extracted by pressure.

This system is well spoken of by those who have adopted it and should answer here for those who wish to work in a small way, without incurring the expense of machinery.

STORING, BOTTLING, &C.

The final operations in cider making are storing and maturing. If properly prepared, it may be stored away in casks, jars, or bottles; but ciders weak in alcohol should be carefully bottled as soon as possible after making.

Those which have a fair amount of alcohol, say 8 to 10 per cent. (which is the average amount in most of the ciders made in the State), will keep well in good sound casks, if stored away in some cool place where the temperature is fairly even and free from the sudden atmospheric changes so prevalent in our climate.

The bottling is extremely simple, yet it must be done with care. The liquid is run from the cask to the bottle by the aid of a long nosed tap or syphon, and carefully corked down.

I cannot do better than quote the following extract by Mr. Lumley on this subject :—

" The secret of bottling wine with success consists in the exercise of much care and cleanliness. (Cider is known as apple wine, in France and elsewhere.) The bottles should be sound, clean, and dry, and free from the least trace of mustiness.

Experience proves that wine bottled in fine dry weather preserves its clearness and liquidity much better than that bottled in damp weather. The wine should be clear and brilliant or it must be fine and clarified before being finally bottled.

Care must be taken to avoid shaking the cask and so distributing the sediment during the operation. The remaining portion which cannot be drawn off clear should be strained off through a wine bag, and then bottled as inferior wine.

The corks should be of the best quality, and before being placed in the bottles, should be soaked and compressed by a cork squeezer. After carefully corking, either by the ordinary methods, or by the aid of a corking machine, the top of the bottle should be protected by a capsule or wax. In many cases both materials are used, as there is danger of ingress of air through the pores of the cork, or from insects eating their way into it. Before placing on the capsules, it is necessary to tie down the cork with either wire or string, as the pressure caused by the carbonic acid gas created within, is considerable.

The storage of bottles is best effected by placing in racks in a cool cellar, and each class of cider should be placed by itself."

POINTS TO BE OBSERVED.

Briefly the points to be observed are as follows:—

1. *To harvest apples carefully.*
2. When harvesting, pile on boards or straw to mature.
3. Carefully avoid letting the apples come in contact with the earth for any length of time.
4. Allow the apples to remain stored until ripe when best results are obtained.
5. Carefully test fruits for saccharine and acidity and blend accordingly.
6. Mill or crush with machinery properly cleansed with potash lye.
7. Filter with suitable filter as described, to purify and clarify.
8. Ferment with even temperature.
9. Check fermentation, when necessary, by filtration or racking.
10. Rack through filter if possible.
11. Filter through paper pulp, carefully cleansing same.
12. Pasteurize to destroy fermentation, and avoid over-heating.
13. Keep records of specific gravity, &c.
14. Record changes frequently.
15. When fermentation and filtration are completed, transfer to clean bottles or casks, corking tightly with best corks and wire down.
16. Stack bottles on side, not end.

WHEAT IMPROVEMENT COMMITTEE.

DISEASES AND PESTS OF CEREALS.

H. Pye, Principal, Dookie Agricultural College.

If statistics could be published of the financial loss to the State, due to the ravages of fungoid and allied pests, the amount would be astounding. If we consider the loss to farmers due to the presence in their crops of Bunt, Black Smut, Leaf Smut, Take-all, and Rust, this loss alone would impress on them not only the utility, but the urgent necessity, of exhaustive experiments to produce varieties having the power to resist the attacks of parasitic pests; and, until this end is achieved, to find methods of checking, if not destroying, them. The farmer who studies and understands the life-history of these pests is often enabled to keep his farm free from some of them. Others of them, such as rust in wheat, are beyond the control of the farmer, except that he may grow certain varieties that, in his district, have the power to resist diseases.

Experiments in connexion with the production of such varieties have, for many years, been carried out at the College. In the early days, the production of rust-resistant varieties claimed considerable attention; but, as rust is seldom present at the College Farm in sufficient quantity to considerably reduce the yield, the conditions were not such as to enable a proper test to be made. It is possible, however, to carry on interesting experiments and research work in connexion with bunt (*Tilletia levis* and *T. tritici*), this disease being prevalent in all wheat-growing areas where the pickling of seed is not systematically carried out. The experiments in relation to bunt were carried out last season on a more comprehensive plan than during the previous season. Over 200 experiments relating to this disease alone were under observation; but, as Mr. McAlpine, the Government Vegetable Pathologist, had a free hand to acquire results for his new work on the Smuts of Australia, it will not be necessary for me to deal with details of a more or less technical nature. The scope of the work intended to increase our knowledge of bunt diseases is, in the main, embraced under the following heads:—

(1) The production of bunt-resistant varieties of wheat;
(2) To determine the most effective and economical fungicides or pickles and the best methods of using them;
(3) To determine the losses due to pickling;
(4) To determine the loss due to sowing unpickled wheat in soil infected by a diseased crop grown during the previous season;
(5) To note the effects of re-infection due to placing pickled wheat in infected bags, or utilizing infected seed-drills, &c.;
(6) Comparative tests of the more commonly-grown wheats in regard to bunt-resistance.

COMPARATIVE TESTS OF VARIETIES IN REGARD TO BUNT-RESISTANCE.

Tests of some of the better known wheats were made to determine their comparative resistance to bunt disease.

The fluctuations from year to year are slight; but, on the whole, all the wheats generally grown are much subject to infection. The harder or somewhat semi-translucent varieties appear to have a smaller percentage bunted. This may be due to an inherent power of resistance, or to the pickle more readily reaching all parts of the grain. In some varieties the crease is deep and rather narrow; hence, spores could rest at the bottom without being wetted or destroyed, owing to the imprisoned air preventing the fungicide from soaking in to them. Also, in some varieties, the brush is large and catches bunt spores, and the germ end

sometimes shows a comparatively deep, narrow crease capable of harboring occasional spores. In these cases we may account for an occasional bunted ear in a crop sown with pickled seed. In another part of the report mention is made of pickled and unpickled seed having been sown in an infected field. The object of such an experiment is to accentuate the importance of a rotation in checking diseases, and of the necessity for pickling.

How long a field may remain infected, my tests have not been sufficiently conclusive to prove. On one or two occasions bunted ears have been found in soil infected two years before. This continued infection may be due to a bunt ball being detached from a diseased plant by being threshed out before the plant was pulled up and destroyed, or to some such means.

The life-history of a spore has been worked out; but, in order to unravel the contributory causes of the prolongation of infection, it is as well to consider the research under the conditions in which farmers are generally placed. Mr. McAlpine, whose work shows so much painstaking observation, will, no doubt, treat of the subject in his usual thorough manner. A glance at the following table will show how very liable to bunt is all of our commonly-grown wheats. In this set of experiments, Medeah, a durum wheat, is the only one free from the disease. Although not generally known to farmers, it is the best known durum variety in the Commonwealth; and for the comparative tests in bunt-resistance it has been grown in the College plots. Early Barellett is an Argentine variety, the name of which, I believe, is mis-spelled. It is somewhat translucent, and of the Fife type. In the experiments in connection with bunt, I have grown, adjacent to each infected row, one row of uninfected grain. This was so that the comparison in all cases would be a proper one. It happened in two instances that the apparently clean grain had by some extraneous means become previously infected, or the infection was in the grain from the first.

One interesting experiment, and one that I have carried out for years, was the sowing of apparently clean grain taken from an ear part of which was diseased. It was at first thought that if the clean grains of a naturally-infected ear were sown after being artificially infected, they might resist the attacks of the disease. But they invariably prove to be liable to infection. Thirty-two grains were taken from the apparently clean portion of an ear of a Steinwedel-blooded variety, the remainder of which contained bunted grains. Sixteen of these apparently clean grains were artificially infected with *T. levis*, and sown 8 inches apart. The remaining 16 were sown without being artificially infected. Eleven of the infected seeds, and one of the non-infected seeds produced bunted plants. It is, of course, possible, in the handling of the grain in a bunted ear, for a spore to fall on and infect an adjacent grain; or the mycelia may have just reached the grain, and a spore been produced just about the ripening period, and so no headway was made on the remaining part of the grain, as partially infected grains have been found.

Florence and Genoa, two varieties received through the Wheat Improvement Committee, and, I believe, bred by the late Wm. Farrer, proved to be bunt-resistant, but not immune from the attacks of the disease. It may be noted that the greater proportion of ears infected was those from the secondary or late growth. It may also be noted that, in this experiment, the germination of the moist-infected grains was comparatively better than that of the clean seed and of the dry-infected grains.

TABLE A.—COMPARATIVE TESTS OF FUNGICIDES AT DOOKIE AGRICULTURAL COLLEGE.

No. of Plot.	Treatment of Seed sown 23rd June, 1908.		Date of Germination.			Percentage of Germination on 30th October, 1908.			Percentage of plants bunted.		
	Infection.	Pickling.	Wallace.	Comeback.	Kubanka.	Wallace.	Comeback.	Kubanka.	Wallace.	Comeback.	Kubanka.
1	Clean seed	Not pickled	July 18	July 18	July 18	81.00	83.00	60.00	Free	Free	Free
2	1 ball bunt to 100 grains—dry	Not pickled	18	18	18	74.00	85.00	65.00	64.86	44.70	29.23
3	1 ball bunt to 100 grains—wet	Not pickled	18	18	18	86.00	85.00	59.00	83.95	74.11	30.50
4	1 ball bunt to 5 grains—dry	Not pickled .. .	18	18	18	75.00	92.00	60.00	90.66	45.65	41.66
5	1 ball bunt to 5 grains—wet	Not pickled	18	18	18	90.00	82.00	56.00	82.22	81.70	48.21
6	Infected .. .	Bluestone, 1 lb. to 4 gals. water	23	20	19	35.00	28.00	37.00	5.71	10.71	Free
7	Infected	Formalin, 1 lb. to 40 gals. water	18	18	18	73.00	70.00	50.00	1.37	5.71	6.00
8	Infected .. .	Corrosive Sublimate, 1 lb. to 50 gals. water	19	18	19	96.00	74.00	61.00	Free	2.70	Free
9	Infected	Potassium Sulphide, 1 lb. to 16 gals. water	19	18	18	86.00	76.00	51.00	70.93	81.58	17.64
10	Infected .. .	Immersed in hot water (132° to 133° Fahr.) for 10 min.	19	18	18	47.00	52.00	35.00	2.11	5.77	Free
11	Sown near bunt balls .	Bluestone, 1 lb. to 4 gals water	23	19	19	55.00	70.00	35.00	Free	Free	Free
12	Sown near bunt-balls .	Not pickled	18	18	18	77.50	80.00	50.00	12.90	21.87	5.00
13	Infected	Immersed in limewater, 5 min	18	18	18	72.50	77.50	42.50	62.07	70.97	5.88
14	Infected	,, ,, 10 min	18	18	18	77.50	85.00	35.00	58.06	52.94	28.57

NOTES.—*Telletia tritici* used for infection. Plots No. 8 to No. 10, 100 seeds each. Plots No. 11 to No. 14, 40 seeds each.

TABLE B.—TEST OF THE EFFECTS OF DIFFERENT FUNGICIDES OR PICKLES ON GERMINATION.

No of Plot.	How Treated.	Percentage of Germination.	
		Comeback.	Kubanka.
1	Not pickled	80	45
2	Bluestone, 1 lb. to 10 gals. water	58	22
3	,, ,, 8 ,, ...	45	28
4	,, ,, 4 ,, ...	30	21
5	,, ,, 2 ,, ...	32	15
6	,, ,, 2 ,, ... (and immersed in lime water for 5 minutes)	61	41
7	Formalin, 1 lb. to 50 gals. water	77	52
8	,, ,, 45 ,, ...	74	39
9	,, ,, 40 ,, ...	75	43
10	,, ,, 30 ,, ..	69	40

NOTE.—100 seeds in each plot.

SUMMARY.—Result inconclusive. Factors other than the pickle used evidently operate on power of germination.

TABLE C.—TEST FOR COMPARATIVE BUNT-RESISTANCE OF SOME OF THE MORE COMMONLY-GROWN WHEATS.

No of Plot.	VARIETY (Sown 22nd June, 1908.)	Percentage of Bunted Plants.	
		Artificially infected seed.	Clean Seed.*
1	John Brown	44.00	Free
2	Dart's Imperial	49.00	"
3	Silver King	56.00	"
4	*Queen's Jubilee*	58.00	"
5	College Purple Straw	58.00	"
6	Hudson's Early Purple Straw	47.00	"
7	Jade	43.00	"
8	Comeback	50.00	3.00
9	Cumberland	49.00	Free
10	*Improved Steinwedel*	56.00	"
11	Federation	40.00	"
12	Jonathan	28.00	"
13	Medeah	Free	"
14	Bobs	43.00	"
15	Early Barellett	20.00	"
16	Stanley D.	11.00	"
17	Dexter	34.00	"
18	Mudgee	6.00	"
19	Cedar	14.00	"
20	Clean grains taken from ear partly affected by *T. levis*	68.75	6.25

* This seed was taken from plants grown from seed pickled before sowing in 1907.

NOTE.—Plots No. 1 to No. 16, 100 artificially-infected (*T. levis*) and 100 clean seeds sown in each. Plots No. 17 to No. 19, 50 artificially-infected (*T. levis*) and 50 clean seeds sown in each. Plot No. 20, 16 artificially-infected (*T. levis*) and 16 clean seeds sown in each.

TABLE D.—TEST OF WHEATS (FLORENCE AND GENOA) AS BUNT-RESISTERS.

No. of Plot.	Variety.	Treatment of Seed sown 17th June, 1908.		Date of Germination.	Percentage of Germination.	Percentage of plants bunted.
		Infection.	*Pickling.*			
				July		
1	Florence	Dusted with dry spores	Not pickled ...	9	82.50	3.03
2	"	Mixed with wet spores	Not pickled ..	9	87.33	5.72
3	"	Infected ...	Bluestone, 1 lb. to 4 gals. water	10	46.25	2.70
4	"	Infected ...	Formalin, 1 lb. to 40 gals water	9	82.50	Free
5	Genoa ..	Dusted with dry spores	Not pickled ...	9	74.50	2.01
6	"	Mixed with wet spores	Not pickled ...	9	85.00	9.41
7	"	Infected ...	Bluestone, 1 lb. to 4 gals. water	16	13.75	Free
8	"	Infected ..	Formalin, 1 lb. to 40 gals. water	10	58.75	Free

NOTE.—Plots No. 1 and No. 5, 200 seeds sown in each. Plots No. 2 and No. 6, 300 seeds sown in each. Plots Nos. 3, 4, 7, and 8, 80 seeds sown in each. It will be noticed *that the grain dusted with dry spores of bunt produced fewer bunted plants than the* grain infected with wet spores.

TESTS WITH VARIOUS FUNGICIDES ON BUNT-INFECTED GRAIN.

The wheats Wallace, Comeback, and Kubanka, were selected to test the comparative value of the fungicides enumerated in Table A. The dry-infected grain was simply dusted with the spores of bunt; whilst, in the wet infection, the seed was allowed to stand over night in a mixture of bunt spores and water. The comparative results, while inconclusive, emphasise the efficacy of fungicides. It may be remarked that the infection was very severe compared with that under ordinary conditions. The highly poisonous corrosive sublimate appears to have given the best results last season, as regards both freedom from bunt and the percentage of germination after pickling.

NOTES ON THE GERMINATION OF GRAIN.

The germination of grain was remarkably irregular this season, both in the plots and in the fields. In some instances it was specially noticeable. This irregularity may be due to the effects of the recent drought on the ripening grain, or to the climatic and other conditions at seeding. The splendid season subsequently experienced seemed, however, to have made up for much of the deficiency, and those wheats which appeared to be rather thinly sown tillered well, and each stalk bore a well-filled ear. In such instances the returns were much beyond expectations.

This season the percentage of germination of wheats treated with bluestone or copper sulphate solution, compared with that of wheat treated with formalin, was as 66.03 per cent. to 86.63 per cent. The seed treated with formalin had the advantage to a considerable degree. With wheat pickled in a strong solution of bluestone, not only was the germination very bad, but the growth in the early part of the season was very poor.

As usual, the steeping of the pickled grain in lime-water had a marked effect on the germination, improving it considerably; although the results of the tests in which the lime-water was used alone do not place it high as a bunt pickle.

In some instances, this season, owing to the unequal germinating power of the wheat, the germination results obtained from pickled grain were better than those from the unpickled.

THE PRODUCTION OF BUNT-RESISTANT VARIETIES.

I have in previous reports introduced the subject of the production of bunt-resistant varieties. In the search for bunt-resistant varieties, I have for some years been breeding varieties by crossing high-typed wheats, possessing to some degree the power to resist bunt, on others, especially on Medeah, a durum, which has proved so resistant to bunt in this district. Although it is not difficult to produce varieties that are, to a considerable degree, capable of resisting the attacks of the disease, it is difficult to produce one that, in addition to possessing that quality, fulfils all the economic and practical needs of the miller and of the farmer respectively.

In addition to the crossbreds enumerated in a previous report, I have this season arranged other crosses. Until they have been proved to be in every respect worthy of distribution, no practical object is gained by publishing the names of these crossbreds. Besides the bunt-resistant varieties bred by me, I have two or three others forwarded by Mr. Sutton, of Cowra, New South Wales, and two, Florence and Genoa, which came through the Wheat Improvement Committee, from the same source.

None of the varieties from New South Wales infected with bunt spores produced clean plots, but the percentage of bunted plants was low, and, in most instances, the bunted plants had only a few of the later-produced ears diseased. Again Medeah proved to be bunt-resistant, or practically bunt-proof, not one of the plants of this variety in any of the experiments being diseased. The following other wheats proved to be bunt-resistant, and were free from diseases after infection. Unlike Medeah, however, they have not stood the test for several years:—

$\frac{\text{Missogen}}{\text{Medeah X White Fife.}}$ Of the selections of this crossbred wheat, two were free from bunt. These selections are really distinct varieties, as they differ so much from each other.

One selection of Allorite X Semi-durum was clean; but the other selection in the row had plants partially bunted.

$\frac{\text{Blue Heron (an Emmer)}}{\textit{Egyptian X Tardent's Blue}}$ had four selections free from bunt; while other selections contained from one to three partially bunted plants.

$\frac{\text{Tripola}}{\text{Tardent's Blue}}$ had three selections free from bunted plants. The other selections were slightly bunted.

In $\frac{\text{Tripola}}{\text{Bobs X Medeah}}$ three varieties were free.

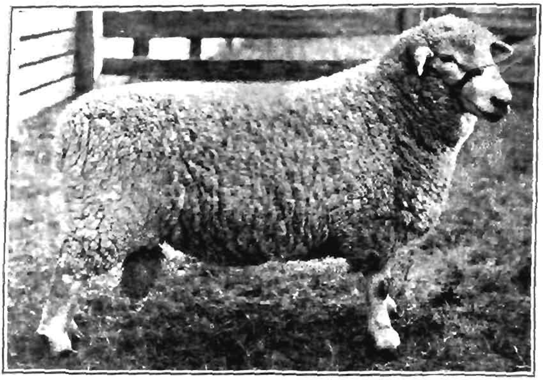
$\frac{\text{Medeah}}{\text{Bobs}}$ was the parentage of a number of varieties. Of these, eight were free from bunted plants grown from infected seed; while nine other varieties of the same breeding each contained a few partially-bunted plants.

ROMNEY MARSH SHEEP.

H. W. Ham, Sheep Expert.

The Romney Marsh breed is gradually working into a good position, and as long as a boom is not created for them, they have a good chance of proving of service. In the history of all breeds of sheep there is a class of breeder, usually with plenty of capital, who will take up a breed with a deal of enthusiasm, but with little knowledge of the purpose of the particular breed.

Such breeders, as a rule, keep them true enough to pedigree, especially with regard to such points as colour of face, legs, hoofs, and nose, shape



ROMNEY MARSH YEARLING RAM, "NEWBOLD."

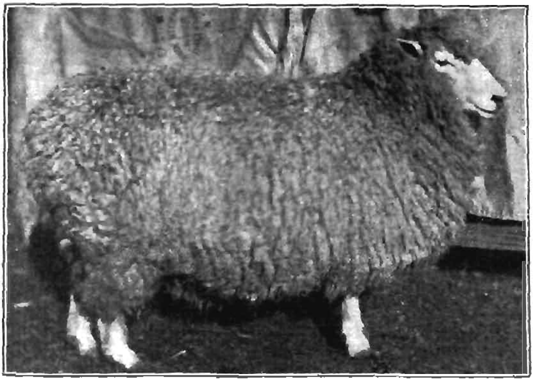
of ears, and (where the country encourages it) nice attractive wool. But these points are only valuable when coupled with a well made thick set carcase. When a boom is on there are always some breeders who offer grade sheep as pure; but these sheep are not to be thought of when wishing to commence a permanent flock, or for stud work.

Romney breeders, and others about to purchase, would do well to consider the aim that the original breeders had in view when they evolved this breed, for Romneys were bred mainly with a view to being a mutton breed of the best quality. At the same time they were to a large extent a grazing sheep, having often to be kept on low marshy land until four-tooth before being fattened. Consequently they were bred to grow a profitable fleece during this time.

The conditions of this class of country also demanded a particularly good hoofed breed, and those that stood these conditions best and came in showing a thick set sturdy frame carrying a profitable fleece, and showing no feet troubles, were selected and bred from. As a result of this, the Romney is a particularly hardy sheep, and where the country is fairly

healthy he is a very good doer, and is particularly hardy in dry autumns and in the depth of winter. But once they begin to be bred hastily for numbers and pedigree only, then they will be found no better than any other ordinary sheep.

Many enthusiasts credit the Romney with being fluke, worm, and foot-rot resistant. They hold that as they were bred successfully on low marshy land they must be immune; but we are not to forget that they have been evolved on well drained marshes, very different to much of our cold unimproved country for which Romneys are recommended. No matter how hardy a class of sheep may be, it has no possible hope of succeeding for any length of time on some of our unhealthy country, notwithstanding drenches and licks.



ROMNEY MARSH EWE. "LADY ELLAM."

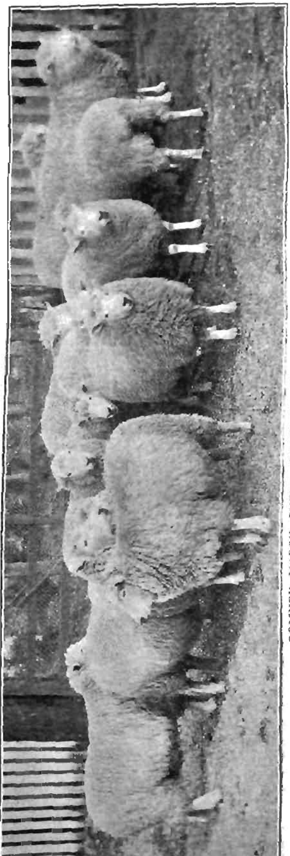
A typical Romney should possess above all else a full girth and level forequarter. As with all breeds, the governing principle is first to acquire good thriving abilities, and this is attained (when the country is fairly healthy) by selecting good shaped stud sheep as broad and full girthed as can be found, and then combining style of fleece and other minor typical points. Good width is mostly a sign of good constitutional vigour, and this point, when coupled with improvement of the pastures and liberal feeding, is the best preventive towards warding off such troubles as worms and fluke.

The Romney is credited with being evolved generations ago from the English Leicester on one side and Ryeland on the other. Romneys as a breed are finer in grain of mutton and grade of wool than the English Leicester and secrete about the same amount of yolk. The wool is shorter in length of staple and rather more dense, but yet sufficiently long to turn the bulk of heavy rainfall and continuous showers in very wet districts. A good Romney fleece, in grade and length of staple, is about mid-way between good Shropshire and good English Leicester.

Although carrying a bulky fleece of medium grade wool, they are not a breed that directs the main portion of what is eaten into wool and yolk; consequently they thrive quickly, and when fattened, produce a very sappy mutton, and sappiness, combined with fine grain of flesh, means quality.

Good Romney rams cross well with roomy merino ewes, fine comebacks, or first cross longwool-merino ewes, especially the latter—for the Romney is a breed that compares closely in both carcase and wool, to Lincoln-merino crossbreds. With graziers depending solely on good seasons and natural pasture, lambs from this cross, if held over, will be found very profitable woolcutters.

There is at the present time some discussion as to the correct type for Romneys. Some breeders are selecting and breeding from a longer stapled and more showy wool type than was thought necessary by English breeders, and in so doing must run a risk of not being able to maintain the highest standard of form. For the Romney, if selected and bred in this climate to the longer stapled, and more crimped character of wool, is practically being bred back to what our English breeders bred partially away from—the English Leicester type. Already we find many pedigreed Romneys showing the English Leicester style of wool, having great length and lustre.



ROMNEY MARSH SHEEP IMPORTED FROM NEW ZEALAND.

True Romney wool is medium in grade, and demi-lustre in colour. Waviness, or character as it is usually called, is desirable in a young well bred healthy sheep, but with ewes rearing lambs, aged ewes, and rams that have been to heavy service, this wavy character, or crimp, is rarely

seen, and in these, want of character is pardonable. Although lustre itself is created to a great extent by the country sheep are bred in, it is usual to find with Romneys showing the most lustre and length of staple, a tendency to the thinner and rather longer ear. This, when considered together with lengthy style of fleece, is the first indication of drifting from true type.

Hoofs, also, are a distinct and safe indication of type. The Romney is a black hoofed breed; all black hoofed breeds of sheep are more resistant of foot disease than white hoofed breeds, and Romneys certainly take pride of place in this respect. In the low lying land on which they lived, hoofs had to be stout and thick. By way of comparison, merinoes, as a breed, are the most susceptible to foot diseases, having a white hoof with comparatively thin wall. From a wool point of view, especially, merinoes do not breed true, if showing black, brown, or striped hoofs. Breeders should be just as particular to see that Romney hoofs are all black, as merino breeders are to see that merino hoofs are all white.

A danger our best Romney breeders have to face, is that flock Romneys are too easily imitated. Rams, by neat Lincoln or English Leicester sires, from selected half-bred longwool-merino ewes, resemble Romneys so very closely, that it needs a fair judge of sheep to decide at times what they really are, and the majority of our lamb-raising farmers do not yet know sufficient in sheep matters to discriminate for themselves.

Pure Romneys should have a full level girth, even when in low condition, broad level shoulders which spread the hand when spanning it, loin and hind-quarter as nearly as possible in proportion, short thick neck with proportionately wide head, short broad muzzle, (not sniped nosed) giving plenty room for wide sturdy teeth. Hoofs should be jet black, and in size proportionate to the bone, hair on the legs should be short and a clear white denoting hard bone, which bone should be in weight proportionate to the carcase, whether ram or ewe. Ears should be on the short side, thick and mellow, and covered with soft white hair. The muzzle should be dark, and the face should be a clear white; not the soft white of the merino, or the bluish white of some of the English Leicesters and Lincolns.

In choosing a stud Romney sire, a lengthy level back, with absence of high hard wither, good point at brisket, full behind the arm, good middle, full flank, good leg of mutton, (not too coarse in the breech) well filled in behind, are all additional points to be sought for. In fleece points, a medium grade of attractive wool, of fair length, and medium density only, as well and evenly covered down the fore arm, thigh, and underneath as can be attained without neglecting carcase qualities, as well as a neat top-knot, is sufficient.

Some typical specimens of the breed are here illustrated. The yearling ram, "Newbold," is the property of Mr. W. H. Yelland. "Treverder," Newlyn, near Ballarat, and purchased by him when in New Zealand. This sheep is a wonderfully thick youngster, and very true to type. The ewe, "Lady Ellam," was also bought by Mr. Yelland when in New Zealand, and at the last Royal Show in Melbourne, was awarded First and Champion Prize. The group of Romneys are also New Zealand bred; some of these afterwards went to Mr. S. Wrathall's stud at Geelong, and a few to Queensland.

SYSTEMATIC DAIRYING ON THE MOE SWAMP.

W. A. Herkes, Senior Dairy Produce Grader.

To show what can be attained by the exercise of perseverance and systematic effort, attention is drawn to the farm of Mr. J. J. Swingler on the Moe Swamp. The property, known as "Glen Iris Farm," is situated on the banks of the main drain. The illustration opposite (No. 2) gives a general view of the swamp and shows the extent to which settlement in this part of Gippsland has been brought in a comparatively short time.

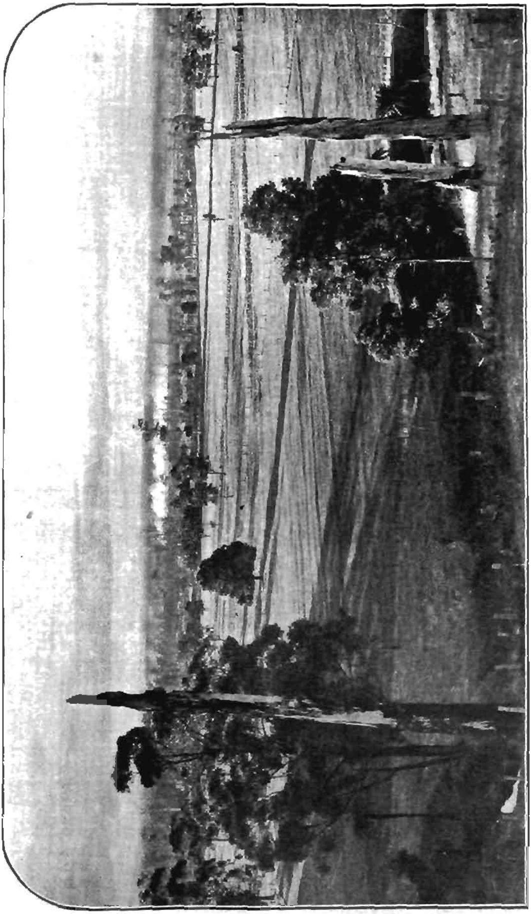
Previous to settlement, the land in question was covered with a mass of trees, tussocks, and reeds. Some idea of its condition will be formed from our first illustration. Readers can imagine the hardships encountered by the pioneers. Many of them, like Mr. Swingler, had large

1. CONDITION OF LAND PRIOR TO SETTLEMENT.

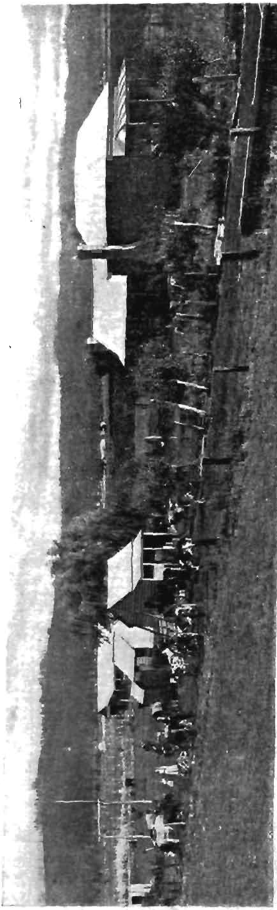
families of growing boys and girls and practically no capital when they commenced operations in this now famous district. The intelligence and energy which this particular family must have expended to bring their small holding of 37 acres freehold and 35 acres leasehold to the present state of excellence in the comparatively short period of 9 years command admiration.

A less suitable time could not have been chosen for securing photographs than the time of my visit (27th April); my object, however, is to place on record the splendid practical results achieved and the methods employed to secure the same.

The farm buildings are not by any means elaborate, but there is a comfortable home. Improvements in the form of an up-to-date milking shed and a modern piggery will shortly be erected, the opinion being held by the owner that the more comfortable the stock are made, the better will be the commercial return.



2. GENERAL VIEW OF THE MOE SWAMP DISTRICT.



3. HOMESTEAD AND FARM BUILDINGS "GLEN IRIS" FARM.

Illustration No. 4 shows the herd at present in milk, just after a most productive season. With few exceptions the condition of the herd is good. As the cows, Jersey-Ayrshire and Jersey-Shorthorn crosses, are certainly very little if any better in appearance than many other herds in the district, we must therefore look to Mr. Swingler's methods to provide the key to his success. Several notable features stand out, the principal being (1) system of feeding, (2) treatment of cows, (3) system of crop rotation and cultivation.

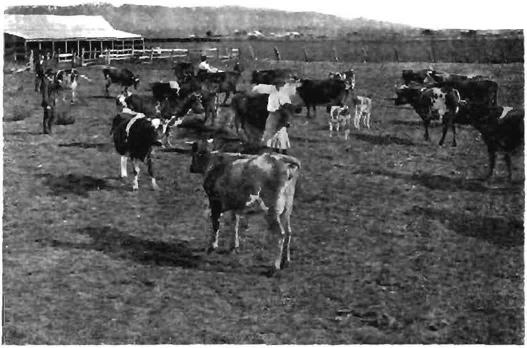
1. System of Feeding.—Whether a cow is in milk or not, she is fed up to her capacity. When dried off she is so fed that when coming into production again her condition is good and no time is lost in making up the waste that too many of our herds show at this particular period.

2. Treatment of Cows.—As shown in photograph No. 4 various members of Mr. Swingler's family are amongst the cows. Each of the children has a favorite cow and the kind treatment goes far to swell production as evidenced by the cheques received.

3. Crop Rotation and Cultivation.—The home farm of 37 acres, subdivided into paddocks, lends itself admirably to the rotation practised. Such rotation, if not complete theoretically, certainly leaves little to be desired in the matter of production. The rotation is oats, potatoes, maize or Japanese millet, followed by grass (rye grass, clover and cow grass) which in turn is cut for hay.

During 1908 there were 25 acres under cultivation, the crops being as follows, viz., 7 acres maize, 6 acres oats (for hay), 3 acres oats (for green

fodder), 7 acres potatoes, 2 acres Japanese millet. This represented nearly an acre under cultivation per cow. If the dairy farmers throughout Victoria would put an acre per cow under cultivation in various fod-



4. THE DAIRY HERD.

ders on their respective farms, not only would they save their herds in time of drought but they would, I feel sure, double the yearly output per cow. Needless to say Mr. Swingler has a system of feeding, viz., grazing

5. WHERE THE CREAM IS SOLD.

from 1st September to about end of January. Millet and maize are then fed in conjunction with grass hay, followed during the autumn by oats grazed and oaten hay.

As dairying is the principal source of income on the farm the following figures will be found of interest. In all, 28 cows were milked during the year with the splendid average of £12 14s. 6d. per cow for cream alone, as shown by the following table authenticated by inspection of the books of the Trafalgar Butter Factory.

	£	s.	d.		£	s.	d.
January	34	12	9	July	6	1	6
February	40	11	1	August	32	9	0
March	28	15	4	September	34	3	6
April	25	5	8	October	53	10	0
May	23	17	3	November	36	17	1
June	8	4	2	December	31	17	0
					£356	5	10

Calves to the value of £25 were sold or kept for herd use; for potatoes the amount received was £93; and for millet seed £10; making a total production from the farm during 1908 of £484 5s. 10d. in cash, to which must be added the value of milk, butter, &c., for a family of 9 persons.

The whole is a result which the owner is justly proud of, though he recognises that still better results can be secured by the continued testing and culling of the herd, the use of a pure bull of dairy type, the further growth of fodder and its conservation by means of the silo which he proposes to erect.

If one farmer in this district, which contains thousands of acres of equally good land, can secure the results quoted above, how is it that the average output from herds is so very much less than Mr. Swingler's? Some might answer that Mr. Swingler has had better opportunities. This is not so, as he started with only the first instalment on the farm paid, a small house, a large family, and a debt of £40; added to these disabilities he suffered the loss of his first year's cultivation through what is still spoken of as the big flood. To-day the capital value of the farm is £1,500, the stocks consists of a herd of 28 good cows, 4 horses, and the owner has a fair balance at the bank, the whole having been secured in 9 years. "Does farming pay?" Mr. Swingler thinks so.

THE DELAYED GERMINATION OF CERTAIN SORTS OF BARLEY.

(Continued from page 292.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in Melbourne University.

In regard to this question, a reply has been received from Prof. Adrian Brown, Professor of Brewing in the University of Birmingham, from which the salient features are extracted as they here follow:—

"The grain appears to be *Hordeum vulgare* var *coerulescens* and is very similar in appearance but somewhat smaller than the kind of *Hordeum vulgare* grown in California and imported into this country (England) under the technical name of Brewing Californian.

"For years I have been familiar with the malting of *H. vulgare* grown in hot climates, but I have never before met with such a case of 'holding

back' of germination as instanced in your Victorian barley. My results when germinating in sand in a Coldar's germinator at a temperature of 75 deg. F. show a germination of 82 per cent., most of the corns showing a strong growth both of roots and plumules. Under similar conditions of germination at 56 deg. F. 90 per cent. have germinated and grown strongly, but of course more slowly than at the warmer temperature. On the other hand, after steeping the barley in water under ordinary malting conditions, subsequently only 29 per cent. showed signs of germination at a temperature of 56 deg. F. Again, alternately steeping the grain in water combined with very free aeration caused 60 per cent. to germinate at 56 deg. F.

"I am inclined to think that for some very obscure reason the grains are peculiarly liable to being drowned when in steep. In the sand germinators in which the dry grain is merely covered with wet sand, so that water absorption and aeration go hand in hand the results of germination are fairly good, and with intermittent steeping and aeration the results also appear distinctly better than under ordinary conditions of steeping. Combined steeping and aeration is being largely employed by Continental maltsters now, and to some extent by maltsters in this country (England). With average barleys it always tends to hearten germination very much and as an experiment I am inclined to recommend such a method with the Victorian barley. I should propose to steep the barley for say 8 hours, run off the water, and if possible throw the barley into another cistern, or at least turn it, and allow it to remain exposed to aeration for 8 hours, subsequently steep again for 8 hours and repeat as before the aeration. Continue until the barley is sufficiently steeped, when probably those corns which are going to germinate will already shows signs of growth.

"Obviously, from the results of some of my experiments the majority of the corns are alive and capable of vigorous germination and I think some modification of the aeration system is the most likely method to start their growth. The whole question is a very interesting one and I should like to know further about your experiences."

Apparently therefore the grain received in England at the end of March had improved somewhat in its germination capacity. Thus under ordinary malting conditions the germination had risen from 10 to 29 per cent., and in the germinators had risen from 46, 65 or 69 per cent. to 82 or 90 per cent., according to the conditions.

Mr. A. O. Barrett suggests that the germination capacity of barley may be affected during transit by the warmth imparted to the hold of the ship by the boilers, or by the sweating of the barley itself when stored in bulk, and that this may favour the germination of difficultly germinable grain. He mentions that in Adelaide the firm has germinative difficulties with the Chevalier or two-rowed sort, whereas in malting the same grain in Victoria none were found to be dormant.

In the particular case under discussion, however, we are undoubtedly dealing with a case of delayed germination due to after ripening, for in May, 1909, the barley harvested in December, 1908, which had previously shown so unsatisfactory germination suddenly gave 96 to 97 per cent. germination in ordinary germination chamber tests without any previous treatment. The same was given by the barley stored in bulk at the malting establishment under malting conditions. In this case therefore we are dealing with a case of after ripening, the time required in Victoria being 5 months, and being apparently comparatively independent of the

conditions of storage. The very important problem remains to determine whether means can be found to hasten or control the process of ripening so that from any given harvest in which the grains have this peculiar delayed germination a malting establishment may be able to insure a supply for each month's consumption of barley which has just reached its maximum germination capacity. The first step will be to determine the processes involved in this apparent after-ripening, and whether they involve a production of ferments, changes in the food-materials or in the cellular or protoplasmic structure of the seed. For this purpose a fresh supply of similar grain will be needed, which it is hoped the next harvest may yield. Apart from the economic aspects of the problem, it will be of interest to determine whether this peculiarity is a biological adaptation acquired by this variety of barley for the purpose of delaying germination until the autumn and winter rains set in and provide moisture for the germinating seedlings.

KILMORE MAIZE CROP COMPETITION.

G. H. F. Baker, Silo Supervisor.

The Kilmore Agricultural and Pastoral Society recently offered a prize for the best 3 acres of maize grown in the Shire of Kilmore. At the time of judging, 23rd February last, only three growers remained in the competition although nine entered originally. Those remaining had

HARVESTING THE MAIZE CROP.

drill-sown crops; the rest had sown their crops broadcast. It might here be mentioned that "broadcast" is the term usually applied to all maize-sowing that is not done on the principle advocated by the Department, viz. sowing in rows with sufficient space between each to permit of the intervening ground being horse-hoed or scarified at least twice after the maize has shown.

Drill-sowing as advocated by the Department allows of the sowing in every fourth furrow, or not less than that distance between rows. Any closer sowing than this is equivalent to broadcasting, as such method precludes any inter-cultivation, consequently moisture is allowed to evaporate

from the ground unchecked in dry weather, and the weeds get every chance to make growth and spread freely. In a dry season such broadcast sowing means disaster to any maize plot that cannot be irrigated, and it was the cause of the withdrawal of six of the nine entrants in this competition. The three remaining competitors were Messrs. Budd Bros., Wallan; Mr. J. J. Ryan, Kilmore; and Mr. W. Richards, High Camp Plain, and the result of the judging placed them in the order in which they are named.

The first crop inspected was that of Messrs. Budd Bros. This was sown 3 feet apart, using two hoes only of the farm drill. Flat Red seed was used at the rate of 28lbs. per acre, and a mixed manure, consisting of 1 cwt. superphosphate and ½ cwt. of sulphate of ammonia per acre, was drilled in at the same time. The soil is of a red, friable, loamy nature. It was kept well-worked and free from weeds. The growth was very good indeed. The plants had attained an average height of 7 feet, and, notwithstanding the dry weather, the crop was still doing well at time of inspection, and would probably yield 12 tons per acre. This yield on a rainfall of 150 points during January speaks well for the cultivation methods of the owners.

The next paddock was that of Mr. J. J. Ryan, who is Secretary of the Agricultural Society. This was grey, loamy ground, which has been continuously cropped for the past 40 years. It was also drill-sown, but hardly enough space was left between the rows for proper working—they were only 2 feet 8 inches apart. In this case, also, too much seed was used, it being sown at the rate of nearly a bushel to the acre. The combined effect of overcrowding the plants, and the absence of effectual inter-cultivation, was shown by this crop during the dry weather, for it stopped growing in leaf and stalk and began to mature, any height made afterwards being mainly due to its flowering. It reached an average height of 5 feet 6 inches, and would probably yield not more than 8 tons per acre. The Flat Red variety of maize was also sown. The accompanying photographs were taken on Mr. Ryan's farm.

The other competitor was Mr. W. Richards, High Camp Plain, whose crop was sown on newly-broken-up swamp land. The soil, very dark grey, sandy loam, was densely packed with a network of marsh weeds and roots which made ploughing very difficult and also materially interfered with the inter-cultivation. This paddock was sown with the Flat Red variety also, in drills 2 feet 6 inches apart only; the drills were not laid straight and these factors prevented any further cultivation, consequently marsh weeds choked the crop. One half-acre, which was sown in drills 3 feet apart and well inter-cultivated, reached a height of 8 feet. It was looking very fresh and green and promised a heavy yield, probably 20 tons per acre, but the balance of the 3 acres sown would be very much below that: the whole would probably average not more than 6 tons per acre.

On the winning farm, that of Messrs. Budd Bros., a small experimental plot of seed maize was sown to test the growth of different varieties for fodder purposes. Eight varieties were sown viz.:—Pride of the North; Solomon's Pride; Sibley; Funk's Yellow Dent; Hickory King; White Horse Tooth; Early Leaming; and a small-grained South American maize, the name of which was not obtainable. The quality of this last variety was apparently much fancied by the rabbits, for they had destroyed almost every stalk of it. Hickory King, a large, flat, white-grained

variety, had made by far the best growth both in height and substance of stalk, averaging about 8 feet high on very thick stalks. Solomon's Pride promised well; it germinated satisfactory, and was growing vigorously with a rich, heavy green foliage and stout stems. It was standing the dry weather exceedingly well. Early Leaming, which attained a height of 5 feet with heavy foliage and good stems, was just blooming; it also stood the dry weather. The germination of Sibley, Pride of the North, and White Horse Tooth, was poor, and the growth inferior. As these varieties have also shown rather poor growth in other

MAKING STACK SILAGE.

trial plots in this district it may be assumed that they are not the best suited for fodder growing locally. Funk's Yellow Dent came early, cobbed well, but the foliage and stems were very light. It attained an average height of 3 feet 6 inches and would yield a poor return.

The following are the points awarded to each competitor:—

Competitor.		Variety. 20	Planting. 20	Yield. 20	Cultivation. 20	Cleanness. 20	Total. 100
Messrs. Budd Bros.	...	10	20	10	20	20	80
Mr J. J. Ryan. .	...	10	18	8	19	20	75
Mr. W. Richards	...	10	16	7	10	10	53

CATALUÑA.

(*Continued from page 330.*)

F. de Castella, Government Viticulturist.

LLANSA.

Provided with a letter of introduction to Don Ramon Ballesta y Sans, I arrived at Llansa on 29th January. I was very warmly received and most kindly shown everything there was to be seen in this most interesting neighbourhood by Don Ramon's son who accompanied me in a long walk during which we visited several vineyards, situated in almost inaccessible situations for the vineyards run up the sides of these steep hills to a height of a couple of thousand feet and more. They rank amongst the most picturesque vineyards I have seen, not excepting those of the Alto Douro in Portugal. Here, once more, one finds Primary geological formations, slates and schists such as we know so well in Australia, and here also does one meet with the Rancio wines almost identical with those of the Priorato in olden times. There is less fortification and less blending, for everything is done on a smaller scale, and more as it was in olden days, than in an important commercial centre such as Reus.

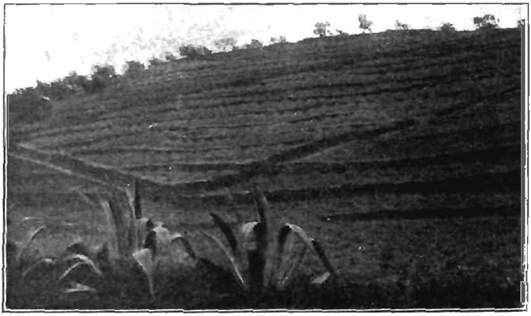
After leaving Figueras, the line runs across rich level country in a N.E. direction, approaching a gap in the high hills before one. At Villajuiga, I saw once more, in a cutting, the rocks so familiar in Australia, but only to be met with in odd localities in Europe, for I was again getting into country of Primary age. Geological formations are a good deal mixed up about here, granite being visible now and again, but further on at Llansa scarcely any but Primary rocks are to be seen. The vineyards of Llansa almost baffle description; viewed from below, one sees little but the retaining walls of the terraces and the diagonal lines of the storm water channels, placed every here and there to provide, as much as possible, against the washing away of the scanty soil. Our photographs give some idea of this arrangement and of the queer patterns presented on a mountain side when a considerable portion of it is, as often happens, covered with vines. The terraces here are by no means level, the retaining walls being only sufficiently high to reduce the natural slope of the ground enough to permit work. They do not constitute, as in Portugal, a regular series of steps. As in the Priorato, it is the most inaccessible vineyards which produce the choicest wines—the best Rancios. In the richer low-lying land, ordinary wines of fair quality are grown but it is only on the Primary rock that they can grow Rancios of quality.

Much of what I have already written concerning the Priorato, applies equally well to this district. There is but little difference. The soil is the same; the Garnacho is exclusively cultivated on the hillsides for the production of Rancio wines and, except in a few rich valley soils, Rupestris du Lot is the only stock used. The Garnacho is here usually known under its Catalan name of Llorane; a white variety of it is cultivated to some extent and yields wine of excellent quality. The grapes of the white and red varieties are usually mixed at vintage.

I was able to take a 5 or 6 mile walk among these most picturesque hillside vineyards. We ascended the mountain to a height of about 1,600 feet before getting out of the vine zone, though at this elevation the vineyards

are not continuous, as they are lower down. Blocks of vines, of a few acres in extent, are separated by varying areas of uncultivated land, covered with scrub, in which we put up several flights of partridges. These birds abound in this wild hilly country, feeding largely on olives, when they are in season, and affording good shooting to local sportsmen. The Spanish variety of partridge would be well worth acclimatizing in Australia. They are said to multiply rapidly and would find, in the scrubby hillsides of many of our ranges, conditions almost identical to those prevailing in the land of their origin.

No buildings are to be found in these elevated vineyards. The grapes are all conveyed to the cellars and crushing houses situated lower down, usually on pack mules with two baskets balanced, one on either side. Where too steep for mules, the grapes are carried on men's backs, but it is astonishing where these sure-footed animals can carry their loads. The only roads are the stormwater channels already referred to—walled in on either side and with the solid rock for bottom. These are torrents when it rains and roads only when it is fine; that is, if the uneven bed of a torrent can be dignified by the name of road.



TERRACED VINEYARDS, LLANSA.

The view from the highest point we reached was magnificent. In the gap in the hills, between the railway line and the sea, one could see the ancient castle of San Salvador which dates from the time of the Saracens. Our photograph gives but a poor idea of the grandeur of the scene.

Though the whole of the region our excursion took us through was in the Pizarra (slate) formation, my guide informed me that a few vineyards are planted in granite. I was rather astonished to learn that these also produced a superior wine, developing the Rancio taste. This is quite contrary to the experience on the Douro (Portugal) where vineyards situated on granite soils, even in the immediate neighbourhood of the celebrated Port wine vineyards, only produce "vin ordinaire" and not Port.

I saw several vineyards in course of establishment in rocky situations. Subsoiling was of course out of the question. Plantation with the crowbar is the rule. A hole is made in the rock in which an ungrafted rootling is planted. Growth is poor and two or three years usually elapse before the young vine is strong enough to graft. These are truly strange

sites for vineyards, especially on resistant stocks, but it must be remembered that the vine is one of the few cultures possible. Under such circumstances, it is surprising that profitable results can be obtained. Judging by the scanty growth, yields must be very light, but quality is high and the demand for these Rancio wines appears to be good. At any rate, plantation is increasing and many growers are extending their vineyards. Young vines are much in evidence, especially in the rocky and almost inaccessible hillsides where the quality of the wine produced renders it readily saleable.

I also visited some of the vineyards on lower land near the sea shore. Here were some stiff clayey soils, as well as fairly sandy patches, in one of which was still to be seen a block of old ungrafted vines, which had not yet succumbed to phylloxera, though it had completely infested the district some 20 years before. The stiffest soils were similar to many of our own, and I much regretted that no experimental plots were to be found, such as might give information concerning the adaptation of some of the newer hybrids in soils similar to our more difficult ones which I had

HILLSIDES UNDER VINES, LLANSA.

so long been on the look out for. Riparia and Rupestris du Lot were the only sorts cultivated—in fact the only ones which had been tried.

Though far from perfect, I was on the whole rather surprised that Riparia stock should do as well as it does. Probably absence of excess of lime has much to do with its success. Even if not present in sufficient quantity to cause chlorosis, this element would appear to interfere with the general health and durability of this stock, which is one of the most susceptible to lime of all American vines.

In these low-lying vineyards, the Garnacho is no longer exclusively cultivated; a good deal of Carineña is also grown, the wine made from the blend being the usual red "vin ordinaire" and not a Rancio.

Apoplexy (known in Catalan as *feridoura* and in French as *folletage*) is rather frequent, more so in the case of stocks grafted with Garnacho than with Carineña. This disease—or rather accident—is more prevalent where

affinity is not perfect, and it is noteworthy that the former of the above varieties is the more "difficult" scion. Stiff clay soils appear to be those in which vines are most liable to suffer from apoplexy.

Pruning was in progress at the time of my visit. I noted, in the lower levels, where spring frosts are feared, the application of the precautionary "preliminary pruning" which I had already seen in other parts of Spain liable to similar trouble. The average yield of grapes in the district, according to Don Ramon, is about 40 cargas (each 120 kilos) to the hectare, or nearly 2 tons to the acre on the lower land. The yield on the hillsides is about one-half this quantity.

WINEMAKING.

Wine-making methods vary a good deal, but crushing without removal of the stalks is the rule. Some wines are fermented for a long time on the marc and are, in consequence, of deep colour when young. Others, again, are separated immediately from the crushed grapes and the juice fermented separately, as for white wine. Much of the Rancio wine is made in this way, the colour of the juice extracted by hard pressure being sufficient to colour the whole, for Rancio wines are often very pale; more intense colour can easily be obtained by blending with a small proportion of wine fermented on the skins.

Rancio wines are almost always fortified. The addition of the necessary spirit prior to fermentation is very usual, even when fermentation takes place in contact with the marc. Much variability exists as to the type of wine made, from vintage to vintage. Some years, most wine is made dry, whilst in others it is all sweet. In a good year the hillsides yield musts of a gravity of 16 deg. and 17 deg. Baumé (*e.g.* 1.125 and 1.133). Heavy rains fell before the 1907 vintage, with the result that most of the wine was made dry.

In Don Ramon's bodegas I tasted several different wines and was particularly interested in the Rancios. These varied in colour, but when over 2 years old were all distinctly tawny and possessed of the characteristic taste peculiar to the type, which commences to develop during the second year. The influence of the cask is considerable, though no special organism seems to be instrumental in bringing about the change, as is the case with Sherry, nor are the casks ullaged. The same casks—usually hogsheads—are kept for many years, specially for the maturation of Rancio wines.

Some of these wines were very fine. They were clean and delicate notwithstanding the fairly high percentage of alcohol, usually fruity, if not quite sweet, and with the characteristic bouquet and taste strongly developed.

The Llansa vineyards have an additional interest in that they are remarkably similar to those which, in France, yield the wine known as Banyuls, the nearest approach to a port, and one of the few fortified sweet red wines made in France. In these, the soil is the same decomposed primary schist, the arrangement of the vineyards on terraced hillsides is practically identical, the Grenache is the variety almost exclusively cultivated and wine making methods are very similar. Banyuls, Collioure and Port-Vendres are the three viticultural centres in this small but interesting district which is only distant from Llansa some 20 miles though the Franco-Spanish frontier intervenes. They will be referred to later. It is here only necessary to point out the great similarity with Llansa, both as regards the vineyards themselves and their products.

RECOVERY OF TARTAR AND SPIRIT FROM MARC.

In the neighbourhood of Llansa I visited a small factory and distillery, for the recovery of what would, otherwise, be waste products from the marc. In Victoria, we allow many hundred pounds worth of by-products of wine-making to be wasted annually, as was also the case, until recently, in Europe. Nowadays, attention is being turned to their recovery, and this Llansa factory was recently erected for the purpose. It buys and treats the pressed marc from vine-growers in the neighbourhood—the average yield per ton of marc being 88 lbs. of tartar and 9 galls. of spirit of a strength of 65 per cent. o.p. The process of tartar extraction was a new one and one which the manager explained to me was a secret: according to him, it gave entirely very satisfactory results. After extraction, the marc was dried in the sun and used as fuel for the steam boilers of the factory. In a country where firewood and coal are as dear as they are in Spain, this was probably the most profitable means of utilizing it. Tartar extraction is largely practised in France, and in a future report I propose to deal with French methods.

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On 30th January, I left Llansa for France, the frontier being only some 4 miles away. The photographs show the last I saw of Spain, a country which I left with very different feelings to those with which I entered it three months earlier—feelings chiefly of gratitude to its hospitable and courteous people for their many kindnesses to me, and assistance in my work, and of admiration for much that I had seen of their agriculture and especially of their viticulture.

AN UNRECORDED POISON PLANT.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in Melbourne University.

Specimens of the common red Pimpernel or Shepherd's Weather Glass (*Anagallis arvensis, Primulaceæ*) have been forwarded from the Mount Camel Estate, Redcastle, with a request for identification and the statement that a number of sheep had died, it was supposed, through eating this plant. Neither Bailey nor Maiden include this plant in their lists of plants poisonous to stock in Australia but there is no doubt as to its poisonous narcotic properties when eaten in excess, although it appears usually to be untouched or eaten in small amounts insufficient to cause injury.

The plant formerly had a high medicinal value being used for a variety of diseases, from epilepsy to snake bite. In India it is still used for leprosy, hydrophobia, dropsy, epilepsy, mania and cerebral affections generally. Half a century ago it was known to possess distinct narcotic properties, and this knowledge was based upon the experiments of Arfilas. No active principle appears, however, to have been isolated, nor are there any records of attempts to do so. This is therefore a case for investigation to determine (*a*) the nature of the narcotic principle, (*b*) its amount, (*c*) the degree of intensity of its poisonous action.

In the East, the plant or an extract from it is used to intoxicate fishes and also to expel leeches from the nostrils. Cases are recorded, however, in which when used for this purpose on dogs and the juice has been swallowed death has followed. In Baden-Powell's *Punjaub Products*, I., page 368, it is stated to kill dogs by producing inflammation of the stomach.

A blue flowered form of the Pimpernel, sometimes called *Anagallis coerulea*, also grows in Victoria as an introduced plant but is not common. Both forms appear to have similar properties.

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

June and July are the most favorable months for planting deciduous trees in the greater part of Victoria. Early planting is advisable in the hotter and drier districts if the soil is well prepared and in a moderately moist condition. The newly planted trees strike roots early and are able to withstand warm and dry changes that are liable to occur far better than those that are planted a month or so later.

Where the soil is sandy and porous planting may be done shortly after a heavy fall of rain without prejudice to the future success of the trees. In the case of stiff retentive soils that are liable to puddle, if at all wet, it is necessary to wait until the excess of moisture has drained away before attempting to plant. Holes must be made to a depth sufficient to accommodate the tree as it stood in the nursery row (or slightly lower), the soil must be trodden firmly to prevent subsequent settlement, and must be firmly packed about the roots. The foregoing points make up the proper planting of trees and it is evident, if the work is done while the soil is in a wet and sticky state, that it will bring an adhesive soil to a putty-like condition, and prevent the admission of air, and when dry, in a great measure, a sufficient supply of moisture to the roots.

The most suitable soil for the culture of fruit trees generally is a sandy or porous loam overlying a mellow clay subsoil; the least suitable, the black tenacious soils overlying basalt rocks. Whatever may be the chemical value of these latter soils from a fertility point of view, it is undoubtedly a fact that the physical features are such that fruit trees fail to thrive when planted in them. The results of over fifty years' experience in fruit growing in this State show that scarcely any profitable commercial orchards exist, or have existed for any time, on the black clay loams mentioned, or on deep, peaty, swamp soils, while good fruit is produced in every part of the State on the silurian or granitic soils, compared with which the deep friable soils of older volcanic origin are decidedly inferior. The sandy soils of the coastal districts are suitable for the culture of pears and other fruits, and alluvial soils are also first class in many districts for fruit growing. The character of the subsoil and clay is often of more importance than that of the surface or true soil, a great depth of which is not necessary for the production of trees that will bear fair and regular crops of fruit of high quality. Drainage is probably the most vital consideration in the culture of fruit trees and vines, and the most important factor in this respect is the tenacity or porosity of the clay, or other bottom soil. It has been often stated that the success of orchards planted on the site of old mining diggings is largely due to the shafts, &c., acting as drains. The same results can be seen in the same districts where no shafts have been sunk. The subsoil is porous and rubble-like and, except in odd instances, never becomes water-logged. The reefs that carry gold bearing quartz are known as silurian and ordovician.

In addition to the soil consideration, aspect and moisture are very important matters in many parts of the State. In the Goulburn Valley and other districts of a like character the dominating factor is the water supply. Aspect does not require much consideration in such places, but it may mean success or failure in other. A situation, say at Monbulk, where the soil does not receive direct sunlight until mid-day or later is useless, no matter what the soil, drainage, and moisture may be. An easterly or north-easterly slope is most suitable in such situations. Low situations are

liable to frost and kinds and varieties susceptible to its influence should be avoided there. Some of the finest apricot trees in the State are growing at Bacchus Marsh, but they are frequently barren solely on account of frost, while at Batesford, near Geelong, it has been found necessary to protect the trees in spring by means of hessian sheets arranged on wire frames overhead. Apples and pears do not suffer under the same conditions and it would be more profitable and would relieve the orchardists of a deal of anxiety if these fruits had been planted instead.

The outlook at present points to apples and pears being the best fruits to plant, especially in the Southern districts. Inter-State markets absorb a great quantity of pears and the opinion of most qualified people interested in various departments of the industry is that the demand is increasing and is sure to continue increasing. Prices obtained are, and have been for some time, profitable and there are no indications at present that point to a likelihood of a serious decrease. The prospect of an increasing trade in pears with England and European countries is also good, but the supply to these markets is not likely to be of great value to growers in Southern Victoria. The popular varieties, Winter Nelis, and Josephine de Malines, are more suitable for planting in the districts north of the Dividing Range and it is fairly certain that if shippers of pears to England could obtain quantities of these varieties from Northern districts they would confine themselves almost exclusively to them.

The export of apples is largely increasing and is likely to increase to considerable dimensions. There are not many varieties worthy of consideration in respect to general suitability for the export trade. Three varieties stand far ahead of all others and there is not the slightest indication at present that either of them is likely to be superseded. One only, Jonathan, is suited to the soil and general conditions of the Southern districts, the others, Cleopatra and Munroe's Favourite, to warm districts north of the divide. There are many places in the Northern districts, such as the valleys of the King, Kiewa, Mitta and other rivers, where the conditions are ideal for the culture of Jonathan apples and where thousands of acres of suitable country are uncultivated and practically unstocked. Of the others mentioned, Munroe's Favourite is the safest to plant. Cleopatra is a very fine apple and commands good prices in London but is very liable to "bitter pit," the only disease of the apple at present, the nature of which, and the remedy for, or against, is unknown.

In commercial orchards, the preparation of the soil for, and planting of, fruit trees is as follows:—The land being cleared of trees and roots to a depth of about one foot is ploughed to a depth of six or eight inches as a general rule. In some cases the land is subsoiled by ploughing in the furrows again without a mould-board. This ploughing breaks up the soil to a further depth of about six inches without bringing the subsoil to the surface. The soil is harrowed and reduced to a fine tilth before planting and the trees are set out in rows about twenty feet apart each way. Holes are dug of a sufficient depth *only* to accommodate the roots of the trees and the general success of the practice proves that it is correct. In places where only a few trees are grown for home supply this practice should be followed as near as possible. Deep holes should never be dug for trees. If the drainage is perfect it is only waste of time and energy; if not on a porous subsoil it is frequently the reason that trees fail. In addition to sinking holes three feet and more in depth a liberal dressing of manure is placed in the bottom to enrich the soil. In nine cases out of ten it produces soil acidity where the drainage is at all faulty. The best plan in such places is to dig the strip of land that is to receive the trees through

its entire length. If manure is necessary it should be dug in over the whole of the worked area. No holes should be dug deeper than the rest of the strip for the reception of the trees.

MANURIAL VALUE OF BATTERY SAND.

Considerable interest has recently been created in the Stawell district by the announcement that the battery and cyanide tailings from the gold mines have been found to possess wonderful fertilizing properties. So that definite information could be supplied to inquirers, samples for analysis were collected at the local mines by an officer of the Chemist's Branch. The results are published herewith.

The analytical examination shows that as far as phosphoric acid and potash are concerned, the tailings are comparable with a good soil, whilst they are very poor as regards nitrogen. The latter is what one would expect from material taken from such depths. It will, therefore, be seen that a dressing of 56 lbs. per acre would be quite useless. Improved conditions of soil, and consequently improved returns, would probably follow the application of a few tons of the sand per acre on stiff clays; but it would not be reasonable to expect an increased yield from small dressings on ordinary soils.

ANALYSIS OF BATTERY AND CYANIDE TAILINGS FROM STAWELL MINES.

—	1. Large heap (300,000 tons) Magdala. Top and bottom samples mixed.	2. Untreated Sands. Magdala.	3. Treated Sands. Magdala.	4. Treated Roasted Sands. Magdala.	5. Untreated Sands and Slimes. St. George.	6. Treated Sand and Slimes (discharge from vat). St. George.
	%	%	%	%	%	%
Nitrogen ..	0.020	0.014	0.025	0.014	0.014	0.031
Phosphoric Acid ..	0.183	0.114	0.157	0.635	0.137	0.113
Potash ..	0.075	0.283	0.219	0.390	0.087	0.179
Lime ..	2.27	0.244	1.54	3.45	0.696	0.844
Magnesia ..	0.763	0.213	0.510	1.55	0.409	0.295
Chlorine ..	0.018	0.030	0.028	0.038	0.002	0.024
Reaction ..	Alkaline ..	Slightly acid	Alkaline ..	Alkaline ..	Very slightly alkaline	Slightly alkaline
Carbonates	Considerable	Nil ..	Considerable	Considerable	Small amount	Considerable
Water Soluble Iron Salts ..	Trace ..	Small amount	Trace	Trace	Fair trace ..	Small amount
HCl Soluble Iron Salts	Considerable (say 1 %)	Considerable	Considerable	Large amount (5–10 % Fe_2O_3)	Considerable	Considerable

All are a mixture of sand with finely divided slate (mullock), with lumps also of the latter. Several, especially 3 and 4, contain lumps of what appears to be lime.

P. RANKIN SCOTT,
Government Analyst for Victoria.

Government Laboratory,
Melbourne, 4th May, 1909.

CHAFF AND STOCK FOOD ACT 1909.

Attention is drawn to the fact that the Act to regulate the sale of chaff and other foods for stock, which was recently assented to, will come into operation on the 1st July next.

CHAFF AND STOCK FOOD ACT, No. 2183.

Short title and commencement.—

1. This Act may be cited as the *Chaff and Stock Food Act* 1909 and shall come into operation on the 1st July, 1909.

Interpretation.—

2. In this Act unless inconsistent with the context or subject-matter—

"By-products" includes husks, bran, pollard, brewers' grains, and materials produced from any kind of grain in any process of treatment or manufacture not being the primary object of such process.

"Chaff" means hay or straw cut into short lengths.

"Foreign ingredients" includes substances which from time to time are prescribed by regulations.

"Hay" means any dried cereal, legume, or grass from which the grain or seed has not been removed.

"Hay chaff" means chaff consisting only of hay.

"Mixed chaff" means a mixture of hay chaff and straw chaff in any proportion.

"Mixed concentrated or prepared stock food" includes—

(*a*) all kinds of meals and foods for stock prepared whether in whole or in part from one or more kinds of grain or oils or juices or meats;

(*b*) compressed fodder; and

(*c*) condimental patented or proprietary stock foods claimed to possess nutritive properties or nutritive as well as medicinal properties.

"Prescribed" means prescribed by this Act.

"Stock" means any animal of the kind or species to which any of the following animals belong—horse, cow, sheep, pig, domestic fowl, turkey, or duck.

"Stock food" includes hay, straw, chaff, grain, mixed, concentrated, or prepared stock food and by-products

"Straw" means any dried cereal, legume, or grass from which the seed or grain has been removed or which has been stripped or threshed.

"Straw chaff" means chaff made from straw.

"This Act" includes any regulation under this Act.

"Parcel" includes sack, barrel, case, and package.

"Vendor" means any person who sells or offers or exposes for sale any stock food.

Sale of mixed chaff prohibited.—

3. The sale of mixed chaff is hereby prohibited.

Chaff when offered for sale to be deemed hay chaff unless otherwise stated. Penalty.—

4. In all sales, contracts, or agreements for the sale or delivery of chaff such chaff in the absence of a written guarantee to the contrary

shall be presumed to be hay chaff; and any person who sells or contracts or agrees to sell or deliver chaff shall in the absence of such a written agreement to the contrary be guilty of an offence against this Act, if the chaff so sold or contracted for is not hay chaff; and shall on conviction be liable for a first offence to a penalty not exceeding £20, and for a second offence to a penalty of not less than £10 or more than £50, and for each subsequent offence to a penalty of not less than £20 or more than £100, or imprisonment for a term not exceeding six months, or to both such penalty and imprisonment.

Foreign ingredients.—

5. The proportion or amount of foreign ingredients which may be contained in any kind of stock food and the character of such foreign ingredients may be prescribed by regulations.

Invoice, &c., to constitute a warranty.—

6. (1) Every invoice, agreement, circular, or advertisement relating to stock food shall state specifically the materials of which such stock food consists.

(2) Such statement in any invoice, agreement, circular, or advertisement as aforesaid shall notwithstanding any agreement to the contrary constitute a warranty by the vendor that such stock food consists solely of the materials so specified and contains no greater proportion or amount of foreign ingredients than is prescribed.

Invoices, &c., as to mixed foods.—

7. Every invoice, agreement, circular, or advertisement relating to any mixed, concentrated, or prepared stock food or to by-products—

(*a*) shall state specifically the original grain or materials from which such food or by-products were prepared, and

(*b*) shall constitute a warranty by the vendor that such food or by-products are prepared only from the specified original grain or materials, and also that such food or by-products are suitable as food for stock, and in the case of any agreement, circular, or advertisement for the particular kind of stock (if any) specified therein.

Invoice to be given by vendor.—

8. Upon the sale of any stock food (whether paid for at the time of sale or not) the vendor shall at the time of sale, or within seven days after delivery of the stock food or any part thereof, give to the purchaser an invoice containing the statements required by this Act.

Offences and penalties.—

9. Any person—

(*a*) who sells or prepares for sale any hay chaff and who mixes therewith any straw chaff;

(*b*) who sells or prepares for sale or offers or exposes for sale or contracts or agrees to sell or deliver any mixed chaff:

(*c*) who sells or offers or exposes for sale or contracts or agrees to sell or deliver any stock food which contains a larger proportion or amount of foreign ingredients than is prescribed;

(*d*) who being the vendor of any stock food fails, neglects, or refuses to give to the purchaser an invoice as required by this Act or sells or delivers to the purchaser any stock food

which does not consist solely of the materials specified in any invoice, agreement, circular, or advertisement relating thereto; or

(*e*) who improperly tampers with any sample or part of a sample taken under this Act,

shall be guilty of an offence against this Act and shall on conviction be liable for a first offence to a penalty not exceeding £20, and for a second offence to a penalty of not less than £10 or more than £50, and for each subsequent offence to a penalty of not less than £20 or more than £100, or imprisonment for a term not exceeding six months, or to both such penalty and imprisonment.

Power of officer to enter premises and take samples.—

10. (1) For the purpose of ascertaining whether the provisions of this Act are being complied with any officer either generally or specifically appointed by the Minister in writing—

(*a*) shall have free access at any reasonable time to any building or premises where stock food is prepared or sold or offered or exposed for sale or to any portion of any farm or land where any such stock food is kept for sale, and

(*b*) may examine and on payment of the ordinary market price therefor take for analysis portions of any such stock food as samples from any parcel whether in or on any such building premises farm or land or from any vehicle.

(2) Such samples shall be of the weight required by this Act, and shall if possible be taken in the presence of the vendor or his agent or of the person having the possession of such stock food or his agent, and shall be taken from parcels comprising not less than 10 per cent. of each whole lot sampled.

(3) The several portions taken from the whole lot of any one kind of stock food sampled shall be thoroughly mixed and then divided into three approximately equal parts. A label shall be placed on each such part stating the name of the vendor or the person having possession of the lot from which such sample was drawn and the time and place of taking. Such label shall be signed by the person taking such sample and also where practicable by the vendor or person having charge of the lot from which such sample was taken.

(4) Each of such parts shall be marked and sealed or fastened up in such manner as its nature will permit: and two of such parts shall be forwarded by such officer to the chemist of the Department of Agriculture or his deputy, and one shall be retained by such vendor or person.

(5) Of the parts forwarded to the said chemist or deputy one shall be for analysis and for comparison with the invoice, agreement, circular or advertisement relating thereto, and the other shall be retained by the said chemist or deputy.

Power to take samples in absence of vendor.—

11. (1) If the vendor or his agent or the person having the possession of such stock food or his agent fails to attend the taking of the samples when notified so to do the said officer may proceed to take such samples in the absence of any such vendor or person.

Notice to vendor.—Portion of sample to be sent to vendor.—

(2) Where the officer has so taken any samples in the absence of such vendor or person or agent he shall forthwith—

(a) give notice in writing of such taking to the vendor or his agent or the person having possession of the lot from which the samples were taken or his agent; and

(b) deliver or forward one part marked and sealed or fastened up in such a manner as its nature will permit to the vendor or his agent or to such person or his agent.

Power to submit samples of stock food for analysis.—

12. (1) Any purchaser of stock food shall on payment to the chemist of the Department of Agriculture of the prescribed fee be entitled to have such stock food analyzed by the said chemist or his deputy and to receive from the said chemist a certificate of the results of such analysis.

(2) Any such purchaser intending to submit such stock food for analysis shall within fourteen days after the delivery of such stock food give notice in writing to the vendor of his intention to have the same analyzed and in such notice shall offer to take and divide at any time within seven days after the service of the notice and in the presence of the vendor or his agent a sample of such stock food.

(3) Such notice may be sent by registered letter through the post addressed to the vendor to his address as stated in the invoice or to his agent to the usual place of business of the agent.

(4) If the vendor or his agent does not within seven days after the service of the notice accept the offer of the purchaser to take and divide a sample of the stock food in his presence or in that of his agent or does not attend personally or by agent at any time or place appointed by the purchaser for the purpose the purchaser may forthwith but not later than fourteen days after the service of the notice take a sample of such stock food.

(5) Every sample taken under this section for purposes of analysis shall be of the weight required by this Act.

(6) The several portions taken from the whole lot of stock food sampled shall be thoroughly mixed and then divided into three approximately equal parts. A label shall be placed on each such part stating the name of the vendor of the lot from which such sample was drawn and the time and place of taking. Such label shall be signed by the person taking such sample.

(7) Each of such parts shall be marked and sealed or fastened up in such manner as its nature will permit; and two of such parts shall be forwarded by such person to the chemist of the Department of Agriculture or his deputy, and one shall be delivered or forwarded to the vendor.

(8) Of the parts forwarded to the said chemist or deputy one shall be for analysis and for comparison with the invoice, agreement, circular, or advertisement relating thereto, and the other shall be retained by the said chemist or deputy.

Meaning of sample of hay, straw, or chaff.—

13. (1) For the purposes of this Act—

(a) a sample of hay, straw, or chaff shall mean any quantity not less than 84 lbs. in weight; and

(b) a sample of grain or mixed concentrated and prepared stock food or by-products shall mean any quantity not less than 20 lbs.

(2) Where in any prosecution or proceeding under this Act a contravention of any of the provisions of this Act is proved in regard to any such sample or any part thereof such contravention shall be deemed to have been proved with regard to the whole lot from which the sample was taken

Prosecutions.—

14. Prosecutions for any contravention of any of the provisions of this Act may be instituted by any officer authorized by the Minister in writing or by any member of the police force who is not below the rank of a sergeant or who is in charge of a police station or by any person aggrieved under this Act.

Power to demand information.—

15. (1) The said officer or any member of the police force may at any time require the purchaser of any stock food to state the name and address of the vendor from whom he purchased such stock food and the price charged or paid therefor and also to produce for inspection any invoice, circular, advertisement, or agreement given to him by the vendor.

(2) Any person who withholds any such information or fails so to produce such invoice, circular, advertisement, or agreement, or obstructs the said officer or any member of the police force in the execution of any of his duties under this Act shall be guilty of an offence against this Act.

Saving.—

16. Nothing contained in this Act and no proceedings taken under this Act against any person shall in any way interfere with any right or remedy by civil process which any person aggrieved by any contravention of any of the provisions of this Act might have had if this Act had not been passed.

Certificate of chemist.—

17. In any proceedings against any person for an offence against this Act where a copy of such certificate containing a notice to the effect of this section has been served with the summons the production of the certificate of the chemist of the Department of Agriculture or his deputy shall be sufficient evidence of the facts therein stated unless the defendant within seventy-two hours after the service of the summons has notified the informant that he requires that the said chemist or deputy shall be called as a witness and that the parts of the sample in the possession respectively of the said chemist or deputy or of the vendor or his agent as hereinbefore mentioned shall be produced. Service of the copy of the said certificate may be proved in the same manner as service of the summons.

Penalty for contraventions.—

18. Any person who is guilty of any offence against this Act or is guilty of a contravention of or who fails to comply with any of the provisions of this Act shall where no penalty is expressly provided therefor be liable on conviction to a penalty not exceeding £10.

Penalty on person actually committing offence.—

19. Where an offence for which a vendor is liable to a penalty has in fact been committed by some agent, servant, workman, or other person, such agent, servant, workman, or other person shall be liable to the like penalty as if he were the vendor.

Exemption of employer from penalty on conviction of actual offender.—

20. (1) Where a vendor is charged with an offence against any of the provisions of this Act he shall be entitled upon information duly laid by him to have any other person whom he charges as the actual offender brought before the Court at the hearing of the charge, and if after the

commission of the offence has been proved the vendor proves to the satisfaction of the Court—

(*a*) that he had used due diligence to enforce the execution of this Act; and

(*b*) that the said other person had committed the offence in question without his knowledge, consent, or connivance, and in contravention of his orders the said other person shall be summarily convicted of such offence and the said vendor shall be exempt from any penalty. The person so convicted shall in the discretion of the Court be also liable to pay any costs incidental to the proceedings.

(2) Where it is made to appear to the satisfaction of the said officer or member of the police force at the time of discovering an offence—

(*a*) that the vendor has used all due diligence to enforce the execution of this Act; and

(*b*) by what person the offence has been committed: and

(*c*) that it has been committed without the knowledge, consent, or connivance of the said vendor and in contravention of his orders,

the said officer or the member of the police force shall proceed against the person whom he believes to be the actual offender without first proceeding against the said vendor.

Authority of Minister for prosecution.—

21. No person selling as an agent on commission shall be prosecuted for an offence against this Act in respect of such sale unless such prosecution is expressly authorized by the Minister in writing.

Simplification of proof in certain cases.

22. In any prosecution or other proceeding under this Act instituted by or under the direction of the Minister no proof shall be required of any order to prosecute or of the particular or general appointment of any such officer.

Power to make regulations.—

23. (1) The Governor in Council may make regulations as to any matters whatsoever not being contrary to the provisions of this Act necessary to give effect to this Act.

(2) Such regulations may prescribe fees for any analysis under this Act and penalties not exceeding £10 for a contravention of any regulation.

(3) Such regulations may order that a copy of any regulation or regulations shall be kept constantly affixed in legible characters in or on some conspicuous place where it may be easily read by the persons employed in cutting, selling, or distributing chaff.

(4) All such regulations when made by the Governor in Council shall be published in the *Government Gazette* and when so published shall have the force of law and shall be judicially noticed and shall be laid before both Houses of Parliament within fourteen days after the same shall have been made if Parliament be then sitting and if not then within ten days after the next meeting of Parliament, and a copy of any proposed regulations shall be posted to each Member of Parliament at least twenty-one days before such regulations are approved by the Governor in Council.

Continuance of Act.—

24. This Act shall continue in force until the 1st July, 1912.

Note.—Copies of the *Chaff and Stock Food Act* 1909 may be obtained from the Government Printer, Melbourne.—Price 6d. each. Postage ½d. additional.

THE JOURNAL

OF

The Department of Agriculture.

Vol. VII. Part 7. 10th July, 1909.

REVIEW OF THE DAIRYING SEASON, 1908-9.*

R. Crowe, Superintendent of Exports.

A critical point has been reached in regard to the Dairying Industry in Victoria. The time has come when all concerned must seriously consider their present position and future attitude towards it. Is it to be looked upon merely as a temporary occupation subject to exploitation when other branches of farming become unprofitable? To continue liable to wreck and disaster whenever a shortage in natural pastures occurs? Will our dairymen remain content with just a ring-fence around the whole of their properties—absolutely without any provision for even rotation in grazing,

THE DAIRYMAN'S STANDBY.

let alone the cultivation of fodder crops? Are the cows to be allowed to die by the tens of thousands every time there is a prolonged dry spell? Are the greater proportion of those remaining to starve periodically, to miss calving and to remain unprofitable?

* Paper read at the Sixteenth Annual Conference of the Australasian Butter and Cheese Factories Managers' Association, held May, 1909, at Melbourne.

There is similar laxity, too, in the treatment of milk and cream in too many places by far. The use of rusty cans, the lack of provision for cooling the milk or cream, and irregular and protracted deliveries are the greatest drawbacks.

Turning to the factory manager, carelessness, and ultra-commercialism are found to be the weak spots in his armour. The former is prolific of every conceivable defect, and the other, a sacrifice of that high standard of excellence and reputation which is incompatible with weight paring, and a certain form of cream grading manipulation.

The far reaching consequences involved necessitate a comprehensive review of all these questions to see what remedial measures may be possible. With most of the matters mentioned, the cure is obvious. I wish I could spend a few days at every dairyman's home so as to kindle his enthusiasm and convince him of the importance of providing fodder and to stir him to act! "Act, in the living present!" Nineteen out of every twenty dairymen one meets are theoretically well posted in these paramount subjects, but on their farms they do not by any means evince a good use of their advanced knowledge. Though able to dilate intelligently upon the respective merits of various kinds of cow feed, they make not the slightest attempt to cultivate or save fodder of any description. Since it is obviously impossible for me to visit dairymen individually, I trust you to do all that lies in your power *to get each of your suppliers to act.* I would suggest that a printed slip be attached to, or enclosed with, each man's monthly account. *It should read as follows:—*

July ...	Sow early spring lucerne which is very appropriately designated "The King of Fodders"; also more mangolds.
August ...	Prepare land for fodder crops. Sow lucerne. Overhaul harvesting machinery.
September ...	Prepare land for summer fodder crops; sow sugar beet.
October ...	Sow early maize, millet, pumpkins, marrows and melons.
November ...	Sow maize. Make sure that all mowing machines and harvesting machinery are in good order.
December .	Sow more maize, millet, and sorghum.—Refer to *Journal of Agriculture*, April, 1909, for best varieties of maize, and methods of planting.
January ...	Sow late maize and sorghum.
February ...	Sow barley, rye, and oats, rape and swedes, for green fodder if rain has fallen.
March ...	Early sowings of Algerian or black oats mixed with peas and tares. Grass and lucerne should also be sown.
April ...	Sow rape, peas, early cabbages, &c. Sow more lucerne.
May ..	Sow oats with other mixtures for hay or silage.
June ...	*Further sowings of mangolds, peas, beans, and rye grass are recommended.*

This outline is of course subject to modification or elaboration to suit the different conditions existing in each district. Such a course would mean getting closer in touch, nearer home in each case—like a "tickler" in the office system—a daily reminder. Factory managers can do a great deal in this way, in the course of a year, by suggestion and encouragement. The second year's "ticklers" might contain such matter as this—

"October. Jack Jones had 15 cows this time last year, and planted 3 acres of maize, his milk cheques for February, March, and April averaging 21s., 23s., and 19s., per cow respectively. This time last season Percy Smith owned eighteen cows and did not plant anything. His cheques for February, March, and April were 13s., 11s., and 5s. per cow respectively. Three of his cows died later on. Moral—*Grow fodder. Now is the time to put it in.*"

BUTTER EXPORTS.

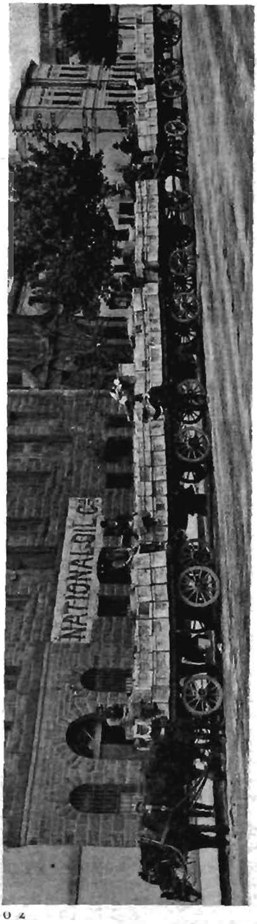
The season about to close is one of the most unsatisfactory yet experienced. Butter exports from 1st July, 1908, to date totalled only 9,456 tons as compared with 14,567 tons for the one preceding and 21,562 tons for 1906-7; 5,983 tons were shipped to Great Britain, 614 tons to South Africa, 690 tons to Eastern Countries, and 2,169 tons to Inter-State Ports. Twenty-eight per cent. of that shipped to Great Britain was unsalted as compared with 28 per cent. last year, and 30 per cent. for the one preceding.

The cause of the falling off in production is indicated in my opening remarks, and the remedy lies in the direction of adopting dairying as a permanent and reliable industry—one that lifted those on the land out of their difficulties years ago when no export trade existed for surplus perishable products. Then it was considered that dairying would prosper if an average of 3d. per gallon could be relied upon. This bedrock limit has been far exceeded, the average prices for the last two seasons having been from 30 per cent. to 50 per cent. above that level. This has unfortunately rendered many independent of the constant work entailed by the keeping and milking of cows. Successful dairymen have made sufficient money to enable them to purchase neighbouring properties at extremely high prices—to follow the lighter occupation of grazing and lamb raising.

In a recent issue of the *Age* the following paragraph appeared:—

> Colac.—Several farmers in the district have sold their farms and have gone to Queensland and New South Wales.

In almost every instance the farms referred to were purchased by neighbouring farmers who had acquired their capital chiefly out of dairying.



TINNED BUTTER FOR THE PHILIPPINES.

Those who sold had so enhanced the value of their holdings during recent years by dairying that they were able to sell them at an abnormal price. At first sight, one would think that highly remunerative returns would encourage and develop the industry, but the opposite has, in many instances, been the case. When other branches of farming are remunerative, affluent holders, not unnaturally, drift into more leisurely occupations and allow themselves to become steeped in a sweet and drowsy somnolence. Last season, I was reliably informed that whole herds were offered free to any one who would take them away, so emaciated had they become. My friend refused to accept them at such short notice, as it was a certainty they could not live. Indeed, they all died very soon afterwards, their hides being the only asset left.

Were farms subdivided into numerous paddocks and some of the plentiful growths of spring conserved, their carrying capacity would be greatly augmented. Much more extended cultivation is required to maintain the stock which it is now attempted to carry. It is strange that every one who has working horses provides food so as to keep them strong and in good profitable condition, and yet overlooks the like urgent need of taking the necessary precautions to tide his cows over the season of scarcity.

In a previous report I stated :—

"Our climate is too favorable. It would be better if it were much more rigorous."

The more I dwell on that explanation, the more convinced am I of its truth. Therefore, I must reiterate this statement that with a more severe climate every one would be obliged to provide fodder for stock during the leaner periods, even though it may appear cruel to criticise when the pinch is most acute. Now, however, with a good season—I hope a cycle of good seasons looming ahead—the suggestion that those who permit their cows to starve should be liable to prosecution and penalty for cruelty to animals, merits consideration. It might render cow-keepers more considerate and force them to make proper provision for their stock. In my last annual report I pointed out that, even in the most drought-affected areas of Victoria, dairymen were to be found who succeeded in keeping their herds in full profit without losing a single head, the only possible conclusion being that if all did likewise, the same creditable results would be achieved. It is to be hoped that the monthly "tickler" suggestion too, will be put into practice.

CARELESSNESS AND RUSTY CANS.

It is unfortunate that there is no authority to condemn and force out of use cans and vessels unsuitable for holding milk and cream, for an immense loss is annually incurred through the resulting contamination. Some butter factories, more especially proprietary butter factories, have to a large extent overcome the trouble by taking the matter into their own hands. Whenever a rusty-bottomed can reaches the factory it is refitted with a new bottom and the supplier is debited with the cost. It is one way of meeting the difficulty and I am pleased to note that this system of remedying matters is spreading.

Experiments were made recently by the Department to ascertain the extent of the depreciation due to this cause. A quantity of cream was divided into approximately equal parts, one part matured in properly tinned vessels, the other in vessels from which the tin was worn, with the result that in every case a metallic flavour, like that of tallow, was produced from the cream kept in the untinned vessels, whilst the other

was free from that undesirable flavour. One parcel consisting of two 56-lb. boxes of butter was kept at the Government Cool Stores for eight days and then handed over to a firm of dairy produce salesmen to have each box sold separately on its merits. The result was that the butter manufactured from cream kept in clean cans realized ½d. per lb. more than that made from the same cream which had been kept in vessels off which the tin was worn. A separate experiment was conducted at another factory on the same lines, with exactly similar results; the parcels were three days old when sold and realized ½d. per lb. difference in price. A third parcel was manufactured at still another factory and when five days old both portions realized the same price.

Duplicates were kept in each case and these with an additional one are here for your inspection. They were all made in March and consequently are now ten weeks old. For the past week they have been out of cool store. They were examined yesterday by officers of the Department, who report a difference in flavour of 1, 2, 5, and 7 points respectively in the four experiments, the one showing the greatest variation being matured in the vat containing the cream off which the tin was worn. The degree of rust accounted for the difference.

CREAM GRADING.

Cream delivered to factories varies considerably in quality. Some may be made into butter worth 1s., whilst the other produces butter worth under 10d. per lb., the intermediate loss being due to improper treatment. It is surprising how few there are who do not cool their milk or cream. I dare say there is hardly an individual engaged in the industry who could not give an intelligent lecturette on the importance of cleanliness and the necessity for cooling cream as soon after separating as possible, and yet how few places are there where any serious attempt is made to comply with these requirements.

The continuance of such laxity has at last stirred directors of butter factories to request legislation providing for the compulsory grading of all cream purchased for butter-making and payment accordingly. It is now generally recognised that so long as the same price is paid for contaminated cream as for the best, there is no impulsion to preserve and deliver it in good order. As a matter of fact, the incentive to continue careful treatment on the part of those already so disposed is destroyed.

Officers of the Department, who visit butter factories which do not grade or which do grade and pay the same price all round for their supplies, get the same admission—that whilst other factories are not grading, or paying according to grade, they feel powerless to introduce or maintain such a system. Many of them have advised the Department that they would be most willing to comply with such a procedure if others were compelled to do likewise, thus fully recognising the necessity of some action in order to check the existing laxity and downward tendency.

As overtures are being made at the moment to the Minister of Agriculture by directors and managers of factories to have legislation passed which will render the grading and payment accordingly mandatory a great improvement during the coming season is assured.

OVERLAPPING.

The long periods between some of the cream deliveries suggest a method of collecting which has been so successful at some of our leading butter factories, which reminds me of the necessity for factories having an understanding regarding the territory to be catered for by each.

Co-operative factories in Denmark protect themselves against exploitation by dissatisfied members. Similar action has been taken by the leading co-operative factories in Ireland. According to the last report of the Irish *Agricultural Organization Society Limited* the following resolution was passed :—

That, with a view to the prevention of overlapping and competition for milk supply between dairy societies, and to promote in them the growth of a more co-operative spirit, this meeting strongly urges on such societies the necessity for—

(*a*) Defining, by mutual agreement, the area from which shall be drawn the milk supply of each society.

(*b*) Requiring all milk suppliers within such area to become shareholders, and refusing to accept milk from non-shareholders or from persons whose milk has been rejected by other co-operative creameries on the grounds of its inferior quality or condition; and,

(*c*) Adopting, where practical, a rule binding members to supply all their milk, except what may be required for household consumption.

It would be well if something similar could be done here. Many of our co-operative butter factory companies are not co-operative in spirit, but are now purely competitive trading concerns, encroaching on the territory of neighbouring factories, and duplicating to some extent the cost of collecting supplies. All this waste energy and additional outlay must come out of the cows' teats, so to speak; in other words, the dairyman in some shape or form has to pay the piper.

DEFECTS.

With regard to the defects in manufacture, it is satisfactory to be able to state that mottle was much less prevalent, but that improvement is somewhat discounted by the presence of milky moisture and free moisture in the butter. I am sorry to state that in many cases there are good grounds for suspecting deliberate attempts at loading of butter by the manufacturers, which, however, have not been successful. When a purchaser draws a tryer of the butter and discovers free moisture, or worse still, free moisture which is cloudy or milky, the quality and price are at once discounted. In a few instances, under certain circumstances, there is perhaps no help for it, but, as I have already stated, I have no doubt that clumsy attempts are made to load the butter to the full capacity the law allows. It is difficult, of course, to control either the moisture contents or the cleanliness of the moisture contents in hot weather where insufficient refrigeration is provided. Fortunately the number of factories working with insufficient cooling power is becoming fewer each year. Last season there should have been less reason for complaint because factories were not working up to their full capacities as was the case in previous seasons.

Altogether too much of the butter which arrived at the Cool Stores during the warmer months was very soft, showing that it had been despatched from factory to railway cool trucks under exceedingly unsatisfactory conditions. There are a number of well-managed factories in Victoria whose butter *always reaches the Cool Stores* in a faultless state. It is part of a factory manager's duty to follow his butter from factory to rail and to see that the vehicle in which it is to be conveyed is suitable, and that it has not too long to wait before the cool truck arrives. In warm weather, it is desirable to keep the current day's manufacture at the factory, and, indeed, to put all butter in the factory cool room before sending it to the station. It is a great pity that more butter factory managers do not follow their butter right through to the Cool Stores at least once or twice each season. It would be well worth the company's while to arrange for them to do so, because of the valuable information to be gained under this and other headings.

The quantity of butter finished in a slovenly manner is very suggestive of amateur packing. Managers should not employ untidy men to do such work. It is so easy, so pleasant, and moreover, so important to turn the butter out in an attractive manner, that this detail should never be overlooked.

Frequently we find butters of different colours in the one box showing that this branch has been very carelessly attended to. It may perhaps be considered hardly fitting to keep on repeating these subjects to a Conference of this kind every year, but I must again impress their importance upon you. Hundreds of letters are written season after season to the managers direct upon these topics and I have come to the conclusion that whilst most men only require a reminder when necessary there are others who have to be constantly urged to keep them up to the mark.

The number of samples of export butter analyzed this season was very much greater than last, because, under the iron heel of competition, managers are becoming keener; and the authorities in England, on the other hand, more alert. It would be a bad thing for Victoria if a series of prosecutions were successfully instituted at home against Victorian butter. The average moisture contents of the samples analyzed for the season was 13.69 per cent. as compared with 13.44 per cent. for the 1907-8 season. The Western District butters averaged 13.4 per cent. as compared with 13.32 per cent.; the North and North-Eastern, 13.61 per cent. as compared with 14.08 per cent.; the Gippsland 13.94 per cent. as compared with 13.51 per cent.; and the City factories 13.8 per cent. against 13.08 per cent. The total number of boxes intercepted on account of samples having shown more than 16 per cent. was 776 or 0.28 per cent. as compared with 0.08 per cent. for the season before.

BORIC ACID.

A feature in connexion with the season's exports is the falling off of boric acid contents. The average was only 0.17 per cent. as compared with 0.23 per cent. for the season before. The Western District butters showed an average of 0.22 per cent. as compared with 0.26 per cent.; the North and North-Eastern 0.19 per cent. as compared with 0.25 per cent.; Gippsland 0.18 per cent. as against 0.22 per cent.; and the City factories 0.11 per cent. as compared with 0.14 per cent. Only one consignment of 38 boxes or 0.01 per cent. was intercepted for containing more than 0.5 per cent. boric acid as compared with 180 boxes or 0.03 per cent. for the year before.

DEFICIENCY IN BUTTER FAT.

As a result of—I should say—technical education a new trouble was more pronounced. An increased quantity of butter was found deficient in butter fat as compared with the standard of 82 per cent. under the Commerce Regulations. It is only fair to state that in a few instances, this result was incurred through inadvertence by the use of combined churns and workers recently introduced, and the difficulty at first of securing the lower range of temperatures necessary to obviate the inclusion of high moisture contents. The average butter fat and casein contents (casein below 1 per cent.—the average casein contents of samples analyzed was 0.78 per cent.) of all the samples analyzed was 84.65 per cent. "butter fat and casein" as compared with 84.1 per cent. of "butter fat" only for the previous season. As it takes a considerable time to separate casein and fat the whole of the returns under the Commerce Act last season were grouped, whilst for the season before fat only was quoted. Western

District butters showed 85.43 per cent. fat and casein; North-Eastern, 84.54 per cent.; Gippsland, 84.14 per cent.; and City factories, 84.51 per cent. The total number of boxes blocked during the season was 1,476, or 0.54 per cent. as compared with 0.15 per cent. last year.

QUALITY.

It is unfortunate that a falling off in quality as well as quantity has to be recorded. The following table exhibits a comparison between this and the three preceding seasons:—

TABLE SHOWING NUMBER OF BOXES SCORING VARIOUS POINTS AND PERCENTAGES, SEASONS 1905–6, 1906–7, 1907–8, and 1908–9.

Points.	1905–6.		1906–7.		1907–8.		1908–9.	
	No. of Boxes.	*Percentages.*	*No. of Boxes.*	*Percentages.*	*No. of Boxes.*	*Percentages.*	*No. of Boxes.*	*Percentages.*
100	..	..	..	..	..	..	..	..
99	..	..	2,752	..	1,334	..	..	..
98	52,644	..	44,870	..	23,155	..	8,925	..
97	42,975	..	34,000	..	29,449	..	18,685	..
96	41,518	..	61,850	..	31,442	..	18,609	..
95	58,700	..	95,143	..	81,202	..	31,819	..
	195,837	36.90	238,615	34.87	166,582	34.45	78,038	29.02
94	99,826	..	170,189	..	85,042	..	30,625	..
93	63,536	..	99,408	..	63,380	..	39,412	..
92	87,416	..	58,725	..	47,032	..	32,022	..
91	15,942	..	29,295	..	28,615	..	21,703	..
90	20,069	..	21,291	..	24,663	..	19,184	..
	286,789	54.05	378,908	55.38	248,732	51.44	142,946	53.17
89	9,370	..	11,534	..	18,923	..	14,406	..
88	6,085	..	9,446	..	13,404	..	11,123	.
87	3.525	..	6,133	..	8,720	..	6,421	.
86	3.272	..	5,252	..	7.146	..	4.175	.
85	3.471	..	7,816	..	5,607	..	3.722	..
84	2,592	..	7,521	..	4,672	..	2,993	..
83	3.966	..	3,451	..	3,000	..	2,251	..
	32,281	6.08	51,153	7.47	61,472	12.72	45,091	16.7
82	3,535	..	2,513	..	2,144	..	1,364	..
81	2,126	.:	1,561	..	1,136	..	692	..
80	2,514	..	2,159	..	1,374	..	429	..
79	2,851	..	2,492	..	537	..	161	..
78	525	..	2,466	..	111	..	83	..
77	1,336	..	1,738	..	87	..	34	..
76	950	..	1,143	..	257	..	69	..
75	254	..	561	..	99	..	2	..
	14,091	2.65	14,633	2.14	5,745	1.19	2,834	1.05
Pastry ..	1,616	0.32	938	0.14	984	0.20	10	.003
Total Boxes	530,614	..	684,247	..	483,515	..	268,919	..

The proportion of superfine butter amounted to 29.02 per cent. as compared with 34.45 per cent. for the year before; first grade butter 53.7 per cent. as against 51.4 per cent.; second grade butter 16.7 per cent. as compared with 12.72 per cent., and third grade butter 1.05 per cent. as against 1.19 per cent. There were only ten boxes of pastry, or .003 per cent. as compared with 984 boxes or .2 per cent. for the year before. The chief reason was discrepancy in flavour. Some of our milk supply factories are undergoing exactly the same experience as all milk supplied factories have encountered in the transition stage from a milk supply to the home separator cream supply. In addition to the usual falling off experienced during this stage managers are incurring the full complement of difficulties. Generally all the cream is pooled and one quality made. At first the quantity of this class of cream is not sufficient to warrant separate churnings for each can, or cream vat, and each churning is distinct in quality. This portion of the factory's output is placed under one brand, the result being great irregularity in quality. In many instances we find three different grades included in the one consignment under the same brand—each of half-a-dozen churn marks merits a different score, no two being alike.

SHORT WEIGHTS.

It is satisfactory to learn that only 520 boxes or .193 per cent. were stopped from shipment during the season as compared with 10,840 boxes or 2.24 per cent. for the season before. The firm and consistent manner

CHECKING WEIGHTS, EXPORT BUTTER.

in which exporters were dealt with has put an effective check on the undue paring of weights. In the early history of deficiencies of this class the private and proprietary factories were by far the greatest offenders, whilst for the past season the co-operative factories have held this unenviable palm; 376 boxes or 0.13 per cent. of co-operative butter was stopped. 20 boxes or 0.007 per cent. of the butter from private factories was intercepted, 64 boxes of 0.023 per cent. presented for shipment by agents, buyers, and exporters, not manufacturers, and 60 boxes or 0.022 per cent. in the case of city companies and firms manufacturing and exporting.

PENALTIES.

In all aggravated instances the Customs Department seized the consignments, they were under the Act forfeited to the King, and after a deposit sufficient to cover any expenses and penalties which might be inflicted the exporters were permitted to amend the contents under official supervision, so as to comply with the standard. The balance of the deposit, if any, was returned after deducting the cost of seizure, together with any expenses incurred and the penalty in addition.

LOCAL AND EXPORT BRANDS.

Notwithstanding the periodical suggestions made by the Department that butter to be marketed locally should bear separate and distinctive brands from that intended for export, most of the factories still use identical brands for both. A considerable portion is bought on the local market, sent to one or other of the various cool stores and exported by the purchasers. When factories were advised they sometimes disclaimed any connexion with the transaction replying that they are not exporting any butter the whole of their output being marketed locally. It can readily be seen that, if these butters are not made up for export and shipped in competition with what has been specially manufactured for the export trade, the result is against their interest.

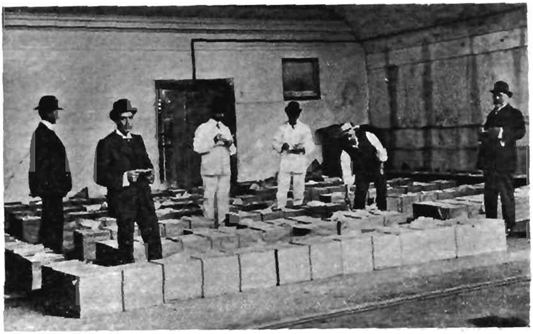
PRICES.

The prices realized on the home and local markets were satisfactory, especially for the best butters, and compared favorably with those obtained by other places, the highest average realized on the London market being 111s. Victorian butter still leads all the other States in regard to the quality and prices for our best brands. However, the difference between the demand for first and second grade butters has been much more pronounced than for some seasons past. This was not so in the early part of the season, but towards its close great difficulty was experienced in quitting butters not of the best quality. This applied to the local as well as to the export market. There were times when choicest butter was readily saleable at a shilling to 1s. 1d. per pound, whilst for mediocre a dragging unsatisfactory market at from 1d. to 3d. below that was encountered. This has had the effect of stirring the makers of poor butters into activity, quite a large number having applied to the Department for help and advice for which they have shown keen appreciation. For the past few seasons, when lively markets were met with, manufacturers had no incentive and were therefore not amenable to suggestions for improvement

GRADING BUTTER.

The criticisms of grading are becoming more kindly as time goes on. From the prices secured by individual factories per the various steamers, it is found that, so far as particulars have been available, they have in every instance coincided with the grades of the butter. In every case the very few criticisms made at home and abroad have, upon investigation, vindicated grading. Early in the season, a most serious complaint was received to the effect that a brand of butter with a first-grade certificate had turned out in second-grade condition. On looking into the matter it was found that four parcels of the brand referred to were shipped by this steamer, two being of first and two of second-grade quality. The second-grade parcels, however, were qualified with a distinctive mark. The Department cabled the Agent-General to secure the certificates, which were used in connexion with the sale of the parcel. The two first-grade

certificates were procured, but the two second-grade certificates were not available, and the Agent-General reported that no certificate number was discernible on the boxes complained of. In view of all the circumstances, it was evident that sharp practices had been indulged in and an attempt made to throw the blame on the graders and the grading system. It is simply remarkable how slow some at the other end are in recognising the necessity for always identifying the certificate number branded on the packages with the number on the certificates. Probably it is because the number marked on the packages forms such an insignificant portion of the brand employed—it is meaningless unless the certificate is produced. This raises the question whether the time has not arrived when all packages should bear a grade mark. In the absence of a grade brand the difference between a 91 butter and an 89 butter is of little consequence, and this holds good with a 95 or a 94 butter. If the standards already fixed were applied to all packages managers would be able to grade their cream and thus classify their butter. I venture to say that if the grading system had been applied in its entirety during the last few years Victorian export butter would have been on a very different plane from what it is on to-day.



GRADING EXPORT BUTTER.

In spite of Departmental supervision Victorian butter is still at times maligned. Only a few weeks ago a letter appeared in the *Age* from an Australian in South Africa, stating that certain reputable Victorian factory brands were used to cover very inferior butter. It was found on investigation that no butter bearing any of the three brands referred to by the writer had been shipped there since 1906—three years back. Such low-down trade tricks must do much harm to the reputation of Victorian butter. The brands, as far as could be gathered, were not registered there. The matter was brought under the notice of the Transvaal Government and copies of the Pure Foods Act and Commerce Act and Regulations were forwarded to show the precautions insisted upon here to have goods, food products especially, covered with a true trade description when offered for sale. It is to be hoped that the South African authorities will take an effective means of stopping these fraudulent practices.

GENERAL.

The great question is how to resuscitate an interest in dairying in Victoria. The large measure of success which we have attained has, as I have already pointed out, had an enervating influence, and something must be done to awaken people from their existing lethargy for—

"Ill fares the land to hastening ills a prey,
Where wealth accumulates and men decay."

The universal use of the plough is what is needed, green fodder—fodder of any kind to commence with—and its judicious growing and conservation as silage or even hay, to provide a stand-by as an insurance against drought. Most excellent advice is published in the agricultural columns of the weekly papers, and in the Department's own *Journal of Agriculture.*

Prospects at the moment are certainly bright and encouraging compared with what they were twelve months ago. We have had splendid rains from the Murray to the sea. In many districts there is a superabundance of feed, particularly in portions of the North East. Dairy cows will be able to pass the winter in good condition, and when such is the case they invariably come into full profit immediately upon calving. It is to be hoped that we have reached the bottom of the cycle of depression and that it will be a long time before it returns. I do trust that dairymen will be made wise by their recent reverses, due, very largely, to their own want of forethought, or, rather, to their neglect to provide against climatic contingencies.

Last winter Victoria sent many shiploads of young dairy stock to New South Wales, and for years men of experience and capital have gone in an almost continuous stream to New South Wales and Queensland. The disastrous results are reflected in the figures relating to the exports from the three States. Only two years back, Victoria exported as much butter as the whole of the sister States put together; that is to say, half the butter shipped from the Commonwealth was produced in Victoria. For the season now closing, our exports will amount to a little over one-third of the total. New South Wales has already caught us and Queensland threatens to do so in the near future. Shall we allow ourselves as a State to be outstripped by our neighbours when we have held the lead so long? Success or failure, progress or retrogression is entirely in our hands. The answer which Victorian dairymen and land-owners give will not only be vital to themselves but vital to Victoria as well. For "There is not one of us so mean and base" that has not an interest in this all-prevading issue. *You,* collectively and individually, *you,* can do much to revive, assist, and establish this truly national industry on a sound and permanent basis.

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In the discussion on this paper the following notes are of interest:—

OVERLAPPING.

MR. CROWE said—I believe we have too many factories; it is not consistent with the true co-operative spirit for them to be at daggers drawn with one another. If there were a better feeling between some of the factories there would be more likelihood of amalgamation. The factory which is conducted on the lines likely to secure the best result to the producer is the one which will gradually draw in the neighbouring factories. It is the close competition existing for cream which is doing all the harm. One purchaser of cream keeps his suppliers up to the mark, and then another

comes along and makes proposals which relieve them of the necessity of being so careful and so gets custom. Some purchasers of cream make quality a secondary matter—they want to get the business and make the turnover paramount.

Cow Testing Associations.

Mr. Crowe remarked—Unfortunately we have no Cow Testing Associations in Victoria. There are two or three in New South Wales and Tasmania. I had some correspondence with New South Wales Cow Testing Associations who wished to get in touch with Victorian organizations, and I gave them the address of one in Tasmania. The system is for farmers to combine and have cows tested at certain periods. I dare say the Department would supervise the milking of the cows, taking of samples and testing at long intervals, whilst intermediary tests would be made by the local butter factory managers.

We have room in Victoria for at least 100 Cow Testing Associations. This class of work in my opinion should be undertaken by the factories, and if the manager cannot do it he should be provided with the necessary assistance. Records of some American Association cows consist of performances checked officially by the Experiment Stations.

I certainly think we should try and improve the existing state of affairs. Whatever part of the State you go to you will find groups of co-operative companies at enmity with one another. This is not as it should be, and I think the co-operative companies should come together and agree as to their boundaries. It was mentioned yesterday that competition was a good thing, and while I agree with this I do not approve of the methods adopted. You know what happens when people are brushed the wrong way. If factories conferred and helped one another amalgamation would be achieved sooner. I know of half-a-dozen instances in which factories should be combined, but the bitterness of feeling between them prevents it.

Pasteurization.

Mr. Crowe.—Everywhere that pasteurization has been introduced and carried out it has been a success. The degree varies according to the manner in which the system is carried out. In the Goulburn Valley they had some difficulty and an officer was sent there. Although he had some difficulties at first he produced a reliable quality of butter before he came away. Cream which had been on the farm three or four days was treated successfully. Considerable improvement can be effected by pasteurization where cows are fed on lucerne. It is an absolute necessity under such conditions. The full advantages of pasteurization are not realized until after a few weeks' time. Some of the officers intrusted with the carrying out of these experiments may give their experience.

Mr. Herkes (Butter Grader).—The consistency of the cream has a good deal to do with the success of the system. Cream of say 35 per cent. after three days will perhaps not pasteurize, but cream of 40 to 42 per cent. will. Some pasteurize and do not use a starter. The benefit in relation to first-class cream is not so much, but the carrying and keeping qualities are greatly improved.

Mr. Watson (Colac).—I do not agree with the remarks concerning pasteurizing low testing cream. Our experience shows that it can be done successfully. In pasteurizing cream which has a large amount of coagulated matter in it, we find that we can get it through by raising the temperature to 180 degrees. If pasteurizing hardens the coagulated matter

in the milk we get good results by straining it, and this leaves no white specks in the butter.

MR. WILSON (Leongatha).—Has it been a success on the Melbourne market as against unpasteurized?

MR. WATSON.—Most emphatically, yes. In our case we have a good many different classes of cream to deal with, from totally different classes of country, volcanic, &c., and some of this cream if unpasteurized would turn out very inferior butter.

MR. PROUD (Korumburra).—If you get into a tight spot in the market better prices are received for pasteurized butter.

MR. MCKAY.—*How often on average do you get your cream supplies?*

MR. PROUD.—The bulk daily. But rich cream three or four days old would frequently give a better result.

MR. LAFFAN (Butter Grader).—I carried out experiments at Tatura recently. On my return I made inquiries and found that there was an increase of 1d. per lb. in one instance and 1½d. in the other on the Tatura butter. At this time of the year there is not a great deal of butter forwarded by that factory to the city. The cream varied from three to four days old and was badly tainted with lucerne. Some of the cream four days old was in a much better condition than some of the two days old cream. In some instances, after getting rid of the lucerne taint, I discovered something worse which the lucerne had hidden.

MR. WILSON.—Is it necessary to use a starter?

MR. WATSON.—We always use a starter. I can quite imagine that there are instances to the contrary. The use of the starter gives uniformity. One of the chief objects in pasteurizing is to get uniformity.

THE FUTURE OF DAIRY FARMING IN VICTORIA.*

T. Cherry, M.D., M.S., Director of Agriculture.

The non-progressive character of the dairying industry in recent years may be seen by a glance at the accompanying graphic representation of Victorian exports of butter since the inception of the trade. The relative number of tons each year is indicated by the depth of the black column corresponding to the date. It will be seen that from a modest 365 tons in 1889/90, the exports rapidly rose to 11,600 tons in 1894/5. During the following four years, production remained nearly stationary at a slightly lower level. The second great expansion took place in 1899/1900, when over 17,000 tons were exported. The average production for each of the succeeding nine years up-to-date has been much below this amount, although on two occasions, 1905/6 and 1906/7, it has been slightly exceeded. There can be no doubt whatever, therefore, that the industry is not only stationary but is actually retrograding. At the same time, the number of agricultural holdings in Victoria has risen from 49,000 in 1904 to 57,800 in 1908, and as dairy farming is a form of industry particularly well suited for families taking up new holdings and making a start in agriculture, one would naturally expect that it would be marked by steady expansion. Several causes may, however, be found for the reverse state of affairs. Dairying is often looked upon as a stepping-stone to some lighter form of occupation which involves less continuous labour, such as stock fattening or wheat growing. As soon as a family finds itself in a position from the profits made from the cows to go into a less laborious although

* Address delivered before the Sixteenth Annual Conference of the Australasian Butter and Cheese Factories Managers' Association held May, 1909, at Melbourne.

less lucrative enterprise a clearing sale is held. I do not think that we can complain of this movement however much we may regret it. The daily milking, morning and evening, year in year out, is an occupation which is attractive to very few. The remedy for this phase in the history of the industry is to show that dairy farming can be carried on in such a way that present profits can be enormously increased, so that where a family has several hundred acres of land in a district of good rainfall the farm can be made a business concern of such size that the proprietor requires to devote the whole of his time to managing his estate. He should no more think of doing the work of a milk hand day after day than the contractor for a line of railway thinks of earning his profits by pushing a wheelbarrow all day long.

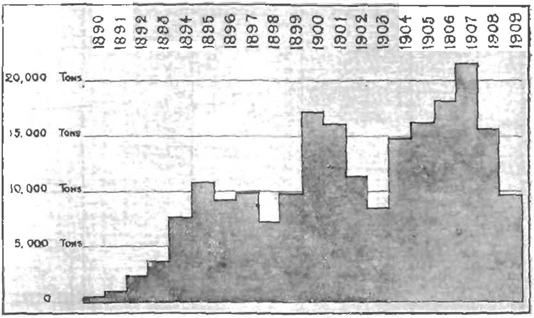
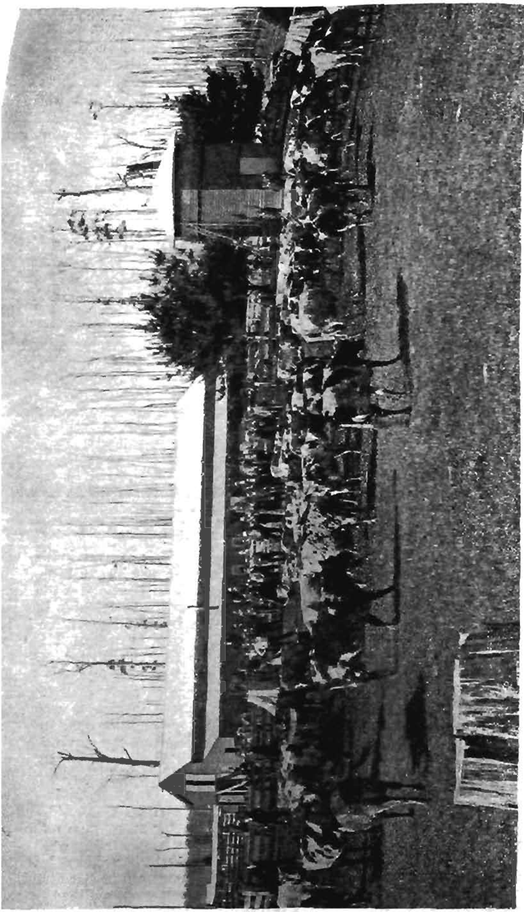


DIAGRAM SHOWING VICTORIAN BUTTER EXPORTS.

This idea of the expansion of thousands of dairy farms in the best districts of Victoria into great business concerns has not yet fired the imagination of more than one farmer every here and there. Yet the thing is perfectly feasible. Every storekeeper and merchant beginning business in a modest way considers he has not made a success of his venture if his sales and profits are not steadily expanding year by year. He looks forward to a time a few years hence when his capital will have accumulated so as to make him independent of financial support from the banks. He carefully dissects the income and expenditure on the various branches of his business. He can put his finger on those departments which are paying and those which are in an unsatisfactory condition, and the fact that he is successful indicates that these methods secure the survival of the fittest. Thousands of our dairy farmers have it in their power to march on from year to year with a certainty and at a rate which can be rivalled by very few branches of human industry and, as far as certainty is concerned, which can be equalled by none. Such examples as Mr. T. Strickland, Darnum, Gippsland, who milks 173 cows for an average return per cow of over £14, and Mr. W. T. Manifold, Camperdown, who rejects from his herd of milking shorthorns all cows which produce less than 300 lbs. of butter in the course of a year, show what can be done by steady and persistent effort along right lines. The success accomplished by these men is within the reach of everyone who will attend to three simple rules which I will elaborate directly. Good luck or special ability may bring success a little more quickly, but it is a fact beyond dispute that where



DAIRY HERD OF MR. T. STRICKLAND, DARNUM.

dairy farming is carried on in districts with a rainfall of 25 inches per annum, or even in an irrigation area, there is no form of human industry which is capable of such steady and uninterrupted expansion or which is likely to give such stable and profitable returns.

SOME TYPICAL SPECIMENS OF MR. W. T. MANIFOLD'S MILKING SHORTHORNS.

While the clearing out sale of the successful dairyman has been responsible for many families relinquishing the industry, there has been in too many cases a compulsory clearing out sale which is wholly unjustifiable. This is due to the fact that the farmer has not been successful; that his returns have steadily diminished; and in too many cases a large number of cows have died. Bad seasons are usually blamed for this state of affairs, but as a matter of fact it is bad management. No proper effort has been made to grow sufficient fodder for the cows to tide over a few months

"STELLA" (MR. W. T. MANIFOLD'S HERD OF MILKING SHORTHORNS).

In milk 6 years; produced 2,001 lbs. butter from 4,239 gals. milk; average per year, 706 gals. milk, 337 lbs. butter. (At 10d. per lb. = £14 per year.)

of dry weather. Consequently, there has been a long period in each twelve months when the cows were dry. With good ordinary rains the following season has been a so-called success, but on the other hand a dry autumn followed by a dry spring has invariably meant disaster. Before Christmas every cow is dry. Very soon afterwards the young stock

are usually affected with cripples. Before long, deaths begin to occur, and if grazing alone is relied upon in too many cases the herd has become decimated. Again I say, that, in every district where the rainfall averages 25 inches per annum, or within an irrigation area, this state of affairs is *merely the result of mismanagement. By working along right lines there* is no reason whatever why each of these failures should not be turned into a conspicuous success.

Another reason for failure is that many men have started on too large a holding for the capital they have had at their command. This is largely *owing to the false idea that it is safe to depend in many districts on* grazing alone. On such a system as this, good luck is the main factor towards a successful issue. Provided several years are encountered in which the rainfall has been copious and seasonable, the inital difficulties *may be overcome and sufficient money accumulated to enable the farmer* to think that he has been successful. Where cultivation, however, is necessary, and I hope to show you that it is necessary on every farm in Victoria, a farm of 60 to 100 acres requires a capital of not less than £700. This is in addition to progress payments towards purchase money or interest. *This sum is made up as follows*:—

House, farm buildings and fences	£165
Implements and machinery	135
First season's seeds and manures	35
15 cows and 3 horses	185
Maintenance of family for 12 months	100
Contingencies, say	60
	£680

Want of capital has caused a very large number of farmers to become absorbed in a lifelong struggle. Specially good seasons enable them to make a little headway, but a time of stress compels them to throw the whole thing up. Even where the capital has been amply sufficient numbers have failed simply from want of method.

THE ESSENTIALS FOR SUCCESS.

A.—The plough must be used to provide sufficient fodder to keep the cows in milk the whole year round.

B.—On everything except the richest ground the manure from the cows must be systematically utilized, in order to increase the fertility of the farm.

C.—Proper records must be kept of each individual cow, so that the unprofitable *ones may be culled out and the general character of the herd improved from year* to year.

A.—CULTIVATION OF FODDER.

First of all, the cows must be properly fed. Grazing is all right for a few months in the Western District and Gippsland, but the experience of last season, during which 100,000 cows have been thrown out of action, *shows that grazing cannot be depended upon if the industry is to be* uniformly profitable and steadily progressive. Taking a farm in a typical southern district such as the neighbourhood of Melbourne, the first thing a beginner requires to do, whether he has a large area or a small area, is to make up his mind to keep a portion of his holding under cultivation *and to increase this proportionately from year to year.* Ultimately, all *parts of the farm* which can be ploughed should be worked on a 5 or 6 year rotation, and after a paddock has been grazed for a few years it should be broken up and cropped before being laid down to grass again. Now, the number of different kinds of fodder which the dairy farmer may grow is fairly considerable, but *there is no reason why he should take on* a large number at the commencement. In fact, I hold that the farmer will do best at first by not attempting too many kinds of crops. When he

has experience in the management of cultivation, so that he can arrange things in such a way that, while the routine work of milking the cows is not interrupted, he may break up the ground and plant a crop at precisely the right moment, the number of kinds may be increased; but, to begin with, four main crops are quite sufficient—two for winter growth and two for summer cultivation. In every case it must be remembered that success depends more upon careful preparation of the land and planting the crop properly at the right moment than upon the fertility of the soil. The old Roman maxim that "In agriculture an opportunity lost one season seldom comes back till next year" should always be borne in mind.

The earliest winter crop to be sown early in autumn should be a mixture of oats, rye, peas and beans in the proportion of ½ bushel each of peas, beans and rye to 1 bushel of oats. In many cases wheat, barley and tares may be added, the total amount of the seeding being fixed at from 2 to 3 bushels to the acre. The peas, beans and tares may be sown broadcast before the paddock is harrowed; the cereals sown together with the drill if the farmer has one, but in any case broadcast sowing will give nearly as good results as the drill. This mixture can be somewhat modified as to give the heaviest crop that the land will carry and the one which grows most rapidly through the winter. The richer the land, the more suitable for barley. The poorer the land, the more important that oats and rye should form the main part of the mixture. The strong stalks of the rye and beans help to support the crop during the later part of the winter. The three or four cereals entering into competition for free air and sunshine make each other grow so as not to be left behind. The admixture of peas and beans very largely increases the percentage of protein or flesh-forming material in the crop and at the same time helps to replace the nitrogen in the soil. The mixture, unless there happens to be too many tares in it, can be readily cut by the reaper and binder. It may be utilized for feed as green fodder, but what I want to insist on is that every farmer should grow a sufficient area of some such mixture as this to enable him to make enough silage to carry his cows in luxury through the summer until the maize crop becomes available in the autumn. If this crop is planted in an average year about the end of February it is ready to cut for green fodder by July, and the balance can be made into silage by the end of September or early in October. Remember that all the leguminous plants attain their maximum food value when they are out in bloom. There is no need to worry about the presence of pods. While the grain is maturing, what happens is that there is merely a transference of the materials already obtained from the soil into the seed. The total fodder value of the plant as a whole is not increasing with the process of ripening but is actually diminishing. These observations hold good also in the case of the cereals. Provided the plant has attained full growth, hay or silage made when the ears first appear is just as valuable as that made at a later stage of maturity.

THE HAY CROP.—The second winter crop is an ordinary sowing of either oats or a mixture of oats and wheat for hay. On the average no better advice can be given than a mixture of Algerian oats with some such wheat as "Dart's Imperial." It should be sown early after the preceding fodder crop has been got in, and it should be harvested towards the end of November after the maize has been planted. In this way seeding time and harvest may both be extended so that the number of hands employed on the farm may be reduced to the minimum. An average seeding on land rather below the average in fertility is 1½ bushels of oats and ¾ bushels of wheat, or 2½ bushels of oats alone. One great reason why this crop should be looked upon as the mainstay of the farm, is the fact that however long the

oats remain in the ground before the rain comes they practically never suffer serious injury from the drought.

THE MANGOLD.—The two crops which make their main growth during the hot weather in summer are mangolds and maize. Mangolds should be sown from June to August. On the average, the best plan is to transplant from a small seed bed. In this case, about the middle of June is the best average time to sow a seed bed, say 15 or 20 feet square in a warm corner of the garden. The transplanting should be done on rainy days in September. In order to make a success of this crop an acre of land should be deeply worked and heavily manured with farmyard manure. It should be ploughed early in winter, manured and cross-ploughed about the end of June, harrowed and scarified once or twice when the friability of the soil is just right, and planted in September. The mangolds should be transplanted, when about the thickness of a lead pencil, into rows 3 feet apart, the distance between the plants being either 8 or 16 inches. In the former case, the intermediate ones may be removed and fed to the cows early in the summer. The others will then continue growing through the summer till the following winter. "Long Red" and "Half Sugar" are the best varieties for the average farmer, and, on the whole, success is to be measured by the total weight of the crop. Forty tons to the acre at the least should be aimed at. To insure this requires a liberal supply of farmyard manure and hoeing or scarifying several times during the summer. The differences in the sugar content of the mangold are just about equalized by corresponding differences in the tonnage per acre. An additional reason for aiming at a very heavy weight has been disclosed by the recent discovery that the fresh juice of green leaves and tubers or fruit acts as a powerful assistant to the digestion of hard, dry food. The indirect benefit of the mangold is therefore probably greater than its direct value in furnishing food to stock. Another reason for selecting the mangold as the standard root crop is the fact that it is the hardiest of all this class of plants. It stands transplanting, drought and excessive heat better than any of the others, and in addition is practically immune from attacks of disease.

MAIZE CROP.—Maize crops for fodder should be grown on every farm in the south of Victoria and, wherever water is available for irrigation, in the north. Under average conditions maize is to be preferred to Japanese millet or the sorghums. I am willing to admit that under special circumstances one or other of the latter may be preferable, but my advice to the beginner is to make a success of maize first and then try the others. Like the mangold, maize should be planted on similarly well prepared and heavily manured land. It should be sown thinly in drills 3 feet apart, and 16 lbs. of seed is sufficient for an acre. For the main crop the proper date, subject to slight local variations, is from the middle of October to the middle of November. The seed should be dribbled in by hand mixed with from 1 to 2 cwt. of superphosphate or other similar manure to the acre. The paddock is then rolled and harrowed, and the harrowing may be repeated when the plants are a few inches high. Subsequently, the care of the crop consists in scarifying between the rows 3 inches deep at intervals of a fortnight to three weeks—depending upon the soil and the incidence of the rainfall. With this treatment a good crop will be grown even in the driest season on record. Under average conditions of 8 or 10 inches of rain during the growing season the yield per acre should average 20 tons of green fodder. Our object is to grow large thick stalks and to secure as heavy a weight of cobs as possible. The disappointment which is often expressed as to the food value of maize fodder is chiefly based on experience with thin spindly stems and a great number of small leaves.

Roughly speaking, half of the food value of the maize crop is in the inside of the stem and the other half is in the cob. For dairy cows the stalks should be chaffed; and when a farmer has a silo in proper working order his object should be to make chaffed maize his main standby for at least six months in the year.

It will be seen that in the above scheme the succulent food for the herd is provided for in the mixed green fodder, the mangolds and the maize. The dry portion of the cow's ration is secured by the hay. If a liberal proportion of peas and beans is provided satisfactory results will be secured without recourse to bran or grains of any kind. Here, again, I do not wish to be misunderstood. In the case of a good herd of cows, each of which is paying her way and showing a substantial profit on the year's operations, it will undoubtedly be a good investment to buy bran, crushed oats or lucerne hay to add to the above food materials. What I want to show is that by proper cultivation methods it is practicable to get satisfactory returns from the herd without spending money outside the farm. When a farmer has attained this position he will probably be quite ready to increase the profits by purchasing additional food from outside sources.

B.—Utilization of the Manure.

The ideal system of dairy farming, whether for milk production or butter, is undoubtedly to house the cows under a properly constructed byre during the cold nights in the winter. It is probably unfortunate for us that our climate is just what it is. It is too mild to make this plan an absolute necessity, while cold enough to entail a very considerable loss by the neglect of proper housing. The chief objection to housing, namely, the dirt which accumulates on the flanks of the cows, may be overcome by proper methods of construction. In the *Journal* for February, 1907, details are given of the construction of a proper floor on which the cows are milked and subsequently sleep on a platform raised from 6 to 9 inches above the level of the roadway down the centre of the shed. Provided this platform is the proper length fore and aft the majority of the cows keep themselves absolutely clean. The variations in temperature during the winter months are reflected immediately by the returns to the butter factories and the general supply of milk. The simple scientific explanation is that in cold weather the body fat which would otherwise be utilized for turning into milk is simply consumed by the tissues of the animal in order to keep her body at the right degree of temperature.

The utilization of the manure is a simple thing once it is collected every morning as a routine portion of the daily work. Messrs. Swan Brothers, near Wangaratta, keep their fine herd of dairy cows to a very large extent with the object of providing manure for their equally fine orchard. Many other examples may be cited in which the mutual dependence of the fertility of the land and the manure from the live stock is recognised. On the average, 1 ton of farmyard manure contains 11 lbs. each of nitrogen and potash and 6 lbs. of phosphoric acid. At current market prices this amounts, at a moderate valuation, to about 10s. per ton. The value of the manure when buried in the ground is, however, infinitely greater than this, for it transfers to the soil countless myriads of active micro-organisms *which can be obtained from no other source*, and it is the incessant activity of these micro-organisms which sets free the latent plant food of the soil. Where the farmer thinks that housing his cows is too revolutionary a method a small paddock should be provided handy to the homestead. If the land is not too valuable it may be two acres in extent. The cows are turned into this at night after their evening meal. If the western fence is a hedge or of palings, or if there is a belt of trees in this direction,

the cows will very soon show how they appreciate shelter. In the course of three months, 30 cows will deposit approximately 100 tons of liquid and solid manure on this small paddock, which should then be broken up and used for cultivation and another one, similar in extent and equally handy, provided for the stock. In this way a number of extremely fertile cultivation paddocks can be established close to the homestead. A handy plan is to make use of a few posts with two or three strands of barbed wire as a temporary fence in the corner of a paddock and shifting on the temporary fence as occasion requires. It will be observed that farmyard manure is rich in nitrogen and potash and comparatively poor in phosphoric acid. In addition to this, phosphoric acid is the chief soil requirement of all our Victorian lands. Every crop, therefore, should be planted with approximately 1 cwt. per acre of superphosphate, dissolved bones or similar phosphatic manure.

C.—CULLING THE HERD.

This matter has been dwelt upon to such an extent that everyone should be now familiar with the details of the method. Provided the cows are properly fed, a record of the milk yield, combined with a test for percentage of butter fat carried out, say every 3 months, changes the whole position of the dairy farmer from one of guesswork and doubt to one of absolute certainty. The first season will divide the great majority of the cows into those which are worth keeping and those which are not. A few may be on the border line and require observation extending over a longer period, but once the habit is established, the ease with which it is carried out and the benefits accruing therefrom are sufficient to make it part of every day's routine work. The reason why records are so seldom seen in Victorian herds is chiefly, I think, owing to the fact that the farmer feels that his cows have not been receiving proper treatment with regard to food during certain months of each year, and as to the milk yield a fair estimate can scarcely be made until the fodder question has received a satisfactory solution. Another important point is that as soon as records are kept the cows receive individual attention as to food and treatment. When hand feeding is the rule it is soon found unprofitable to let the cows hustle after a few sheaves or a load of maize scattered about the paddock. The heavy milker requires most food, but very often she is a poor hustler. This is simply another instance of the way in which intelligent control spells success.

MAIZE AS FODDER.

Departmental Demonstration Plots.

Those interested in the growing of maize for fodder purposes have recognised considerable variation in the growth of the several varieties; not only as regards their individual peculiarities of early maturing and stooling out, but also as regards the growth made by each under different conditions. At the beginning of September last it was decided by the Department of Agriculture to make a number of experiments during that season, to ascertain whether any conclusive evidence could be obtained as to which varieties would be the most profitable to grow for fodder purposes.

The seed for the demonstration crops was furnished by the Field Branch through Mr. F. E. Lee, Agricultural Superintendent. The actual

work was directly under the control of Mr. S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer of the Stock and Dairy Supervision Branch, and was carried out by the Dairy Supervisors in charge of those districts where the demonstrations were conducted. The results obtained concerning the bulk of the plots are now to hand. From a study of them, much may be learned concerning the comparative growth of maize for fodder. No one variety has given such results as would justify a claim for it that it was superior to every other under all conditions and in every district. Several varieties, however, have proved their general adaptability to many and varying conditions. On the other hand, several have been found to be of little comparative value for fodder purposes in particular districts.

ONE OF THE DEPARTMENTAL DEMONSTRATION PLOTS.

Thirteen varieties of seed were made available by Mr. Lee for distribution to the Supervisors; and these were further supplemented by small lots of other varieties obtained by the Supervisors elsewhere—making altogether a total of twenty sorts. These were Sibley, Early Yellow Dent, Early Leaming, Solomon's Pride, White Horse Tooth, Little Yankee, Boone County Special, Funk's Yellow Dent, Longfellow, Hildreth's Yellow Dent, Hickory King, Eclipse, Pride of the North, Yellow Moruya, Ninety Day, Reflet, North Western Dent, Blood Red, Sydney Flat Red, Victorian Flat Red.

Forty-one reports have come to hand, concerning the crops grown in twenty-nine localities, viz.—Malvern, Caulfield, Brighton, Narre Warren, Dandenong, Lyndhurst, Monomeith, Yannathan, Caldermeade, Koo Wee Rup, Clyde, Cranbourne, Gembrook, Warburton, Yarra Glen, Coldstream, Mooroolbark, Croydon, Kew, Preston, Yan Yean, Wallan, Broadmeadows, Somerton, Tullamarine, Sunbury, Parwan, Werribee, and Little River.

In all cases the seed was sown in rows 3 feet apart, so as to permit of the systematic intercultivation of the growing crop. So far as the amount of seed available would allow, each farmer who agreed to take part in the experiment could obtain a sufficient quantity of seed to sow at least half an acre of ground; as well as three or four 1-lb. samples of other varieties. A small quantity of the farmer's own seed which he was using for the growing of his usual summer maize crop was also in most instances sown adjacent to the Departmental samples, and under the same conditions. It was optional with the farmer whether he manured the plot or not. As a rule, the farmer picks out a good piece of ground to cultivate for summer fodder; but if manure was being used for the ordinary crop the Department also supplied sufficient at the same rate for the demonstration plots free of charge.

Apart from such notes as each Supervisor made on his several inspections of the plots under his charge, each grower was also requested to fill in a short observation sheet regarding the development of each variety, and its apparent value at maturity. Many of these sheets were full of interesting details. Where the weight per acre is given this was arrived at by weighing a section of the crop and calculating from that the average of the whole. From the combined information thus obtained the following epitome has been compiled.

Beginning with the coastal districts lying to the south-east of Melbourne, those plots that were grown in MALVERN, CAULFIELD, and BRIGHTON were dealt with in the April issue of the *Journal* by Supervisor J. M. B. Connor.

In BERWICK Shire, Supervisor A. V. Beecher reports:—

"(1) Mr. F. Green, Narre Warren, sowed five varieties, viz.—Eclipse, Hickory King, Hildreth's Yellow Dent, Longfellow, and the farm variety of Sydney Flat Red. Some variation in habit of growth was seen here, particularly as regards the stooling out. The three first-named varieties made a fairly even growth; averaging about 6 feet high, and producing 3 to 4 stalks per seed. Longfellow, with an average height of 4 feet produced as many as 11 stalks per seed in some instances. The other varieties, however, appeared to have had an extra advantage in the thickness of the stalk, for the estimated weights per acre were as follow:—Hickory King 16 tons 14 cwt.; Eclipse 10 tons 6 cwt.; Longfellow 8 tons 4 cwt.; Hildreth's Yellow Dent 8 tons. The sowing of the Departmental samples of seed was delayed on this farm until 19th December in the hope of a suitable rainfall, and the germination as a whole was poor. This fact is probably accountable for the extra weight of fodder obtained from the main farm crop (Flat Red). This was drilled in rows 3 feet apart as advised by the Department, but with 1½ bushels of seed to the acre. With good germination this would have been a much too heavy seeding; but as it was this particular sowing resulted in a crop of 18 tons 12 cwt. per acre.

(2) Mr. J. F. Evans, Gembrook, sowed four varieties on 26th October, viz., Eclipse, Longfellow, Hildreth's Yellow Dent, and Hickory King. A later sowing was made on 9th November of Eclipse, and the farm variety Victorian Flat Red. In both sowings, the Eclipse showed best. Both crops were harvested for silage on 26th April and following days; and consequently the earlier sown crop was rather too dry to allow for a comparison between the two sowings. In the first sowing, Eclipse gave 7 tons 12 cwt., and Hickory King 6 tons 17 cwt. per acre. The weights of Yellow Dent and Longfellow are not recorded. The second sowing gave Eclipse 9 tons 12 cwt., and Victorian Flat Red 10 tons 8 cwt.

With reference to Longfellow, Mr. Evans makes a suggestion in favour of making a small sowing of an early maturing variety at the beginning of the season. His reason for this is that as it matures early it will give a certain amount of more nutritious fodder some weeks before the later varieties are ready to cut. This he considers may often do away with the necessity for cutting into a crop which is not matured, and is in that stage too sappy for good feeding."

In CRANBOURNE *Shire, Supervisor G. McKenzie reports:—*

"(1) Mr. G. Croskell, Clyde, sowed Hickory King and Sibley on 9th December. The farm variety here was known as the Sydney White, but in both appearance and result it was identical with Hickory King. The growth in both the Hickory King and Sydney White was from 7 to 9 feet high; and the estimated yield was 25 tons per acre. The Sibley, though not running over 8 feet in height, had a thicker stalk and a heavier cob. When the samples were weighed on 23rd April, the Sibley showed a 30-ton crop to the acre.

(2) Mr. A. E. Brunt, Clyde, sowed Hickory King, and Sibley, with Victorian Flat Red as a farm crop. Their relative heights were—Hickory King 8 feet to 10 feet; Sibley 8 feet; Flat Red 7 feet. Mr. Brunt considered the Hickory King to be the best for his ground and was well satisfied with the yield.

(3) On Mr. W. Brunt's farm at Cranbourne a similar sowing gave like results, but on a shorter growth all round.

(4) Mr. Hudson, of Koo-Wee-Rup, sowed Hickory King, Funk's Yellow Dent, and Victorian Flat Red on 14th November. In this plot, on 21st April, Hickory King was estimated to yield 25 tons per acre on an average height of 8 feet. At this date both the other varieties had matured, and were too dry in the stalk for a comparative weight test, and were also of much shorter growth.

(5) Mr. Edey, of Yannathan, sowed only two varieties, Hickory King again showing better growth than Victorian Flat Red.

(6) Mr. Glasheen, of Caldermeade, made two sowings of two different samples of Hickory King and Sibley. There was no noticeable difference in the result of either sowing. Hickory King yielded approximately 20 tons per acre, and Sibley 13 tons. A broadcast sowing of Sibley was also made here at the rate of 1½ bushels of seed per acre, and resulted in what is described as a complete failure.

(7) A similar double sowing as in plot 6 was made by Mr. W. C. Greaves, of Monomeith; and, though of shorter growth all through, the comparative results were similar.

(8) Messrs. E. and A. Cameron, of Yannathan, made a similar sowing to that in plot 4 (Mr. Hudson's) on 20th November, and a somewhat similar result was obtained. Here, however, Hickory King yielded at the rate of 28 tons per acre, averaging 8 feet high on 19th April. Yellow Dent and Flat Red were dry at about 6 feet high on same date.

(9) Mr. R. Taylor, Lyndhurst, sowed Hickory King, Eclipse, and Victorian Flat Red on 5th November. In this instance there was little difference in the growth of all three varieties, which were grown on soil of a deep, sharp, sandy nature, the better growth being on the flats.

This was rather an unusual crop on the whole. It was on a well cultivated paddock, manured with the rather heavy (comparatively) dressing of 3 cwt. of mixed superphosphate and bonedust to the acre. It was scarified weekly for 8 weeks, and yet a very patchy crop was the result. Mr. Taylor stated that the Hickory King appeared to wither earlier than the other two varieties.

(10) Mr. G. Williams, of Dandenong, made a similar sowing of seed to that last mentioned (plot 9) on 22nd October; and 1½ cwt. of superphosphate was used per acre. Here, again, though Hickory King was estimated as a 20-ton crop it withered the earliest of the three. Eclipse stood slightly the best as regards colour, and also cobbed heavier. Flat Red was about equal with Hickory King. All three varieties were grown on a flat of deep, sharp, sandy soil, and were about 6 feet high. The crop was scarified four times, and hand hoed once. A later sowing of Flat Red averaged 10 feet high. The yields were found to be greater and the quality better than when sown in the ordinary manner (broadcast).

Taking the plots as a whole all the varieties tested gave very fair results; and, where maize crops in the Cranbourne Shire this season have been drilled in and properly cultivated while growing, little fault was to be found with the yields."

In KEW, LILYDALE, *and* UPPER YARRA *districts, Supervisor J. S.* McFadzean *reports*:—

"Ten demonstration plots came under my supervision; three at Kew, one at Croydon, two at Mooroolbark, one at Coldstream, one at Yering, and two at East Warburton. That at Croydon was a very interesting trial of four sowings of six varieties each, with seed purchased by Mr. Gwillam from the Department.

Besides the maize that was being sown for the usual fodder crop on each place, nine other varieties were tested. The result was decisively in favour of the large white-seeded variety Hickory King. The plots were all sown in drills 3 feet apart, with the seeds about 6 inches apart in the rows. This allows for about 30 to 35 lbs. of seed per acre according to the size of the grain. All but two of the plots were kept cultivated between the rows. One of these two was neglected on account of the extra rush of harvest work; and the other was left to itself through a misunderstanding as to the object to be gained by the repeated working of the soil.

The importance of inter-cultivation in drill sowing of maize appears to be a matter which many farmers fail to fully realize. If the ground mellows down well, and remains loose on the surface, the idea obtains that further cultivation is unnecessary. This is wrong. In dry weather evaporation from an unprotected soil is continuous. This is capable of simple demonstration by observing how moisture gathers at the surface of the soil below wood, bagging, litter, stone or almost any such substance that has been left lying on the ground for a day or two. That moisture which is apparent on lifting the protecting material would have evaporated unnoticed from uncovered ground. Any such protection of the surface soil from the direct rays of the sun when used in cultivation is known as "mulching." In small gardens much of this mulching is done with manure, loose stable litter, cut grass, fern tops or such light material. On larger areas the same end may be attained by keeping a couple of inches or less of the loose surface earth repeatedly stirred. In the course of evaporation the moisture continuously rises through the soil along capillary or hair-like passages through which it escapes more readily to the surface. By repeated stirring of the soil these capillary tubes are kept broken, and a mulch of loose earth is formed on the ground surface. The upward course of the moisture is thus checked; and it remains and diffuses just below that layer of loose soil where the rootlets of the growing plants are abundant. The object of the repeated stirring of the surface soil in

summer cultivation is thus apparent. This work, however, requires to be done with some care.

Scarifying or horse-hoeing can do a lot of harm to a crop if done carelessly; for there is the dual danger of both the moist soil below being brought to the surface, and the surface roots being damaged by working too deep or too close to the growing plants. If too much soil is stirred in the working, too deep a layer of dry earth will be formed; the surface roots will then wither and the growth of the plant will be retarded. Again, although when the maize first comes through the ground scarifying can be done quite close to the young plants without injuring them, it must be remembered that roots grow and spread rapidly. Each successive hoeing therefore should be of less width than the previous one; and care must be taken not to work below the already loose surface soil. Under this treatment the maize plants soon make a heavy leaf growth; and by the shade they thus provide for their roots they become self protecting, and no further working is then necessary.

The varieties of maize sown were Hickory King, Eclipse, Sibley, Hildreth's Yellow Dent, Victorian Flat Red, White Horse Tooth, Early Leaming, Solomon's Pride, Funk's Yellow Dent, Hill's Blood Red, Pride of the North, Longfellow and Ninety Day. The growth of the plots as a whole varied considerably according to the weather conditions immediately following the sowing of each. The varieties, however, maintained their several positions in the plots with remarkable evenness. Hickory King made a growth in the several plots, ranging from 4½ feet on the poorest plot to 10 feet on the best; with a likely average of about 7½ feet throughout. Some of the sowings were fortunate in having a fall of rain within a few days from planting; while others did not get a good shower for several weeks. One of these latter plots came very close to a failure; but all the drilled crops showed to advantage over broadcast sowings under similar soil and weather conditions in each locality.

As previously mentioned, Hickory King stands out from all the other varieties as having made a higher, stronger, and more continuous growth of leaf and stalk than any of the others sown. On several of the plots this variety was fully 18 inches higher than the next best, and far heavier in the stalk. Its growth was a little slower in general than several of the others for the first 3 or 4 weeks; but from then on it made great headway, and continued growing after all the others had matured. From this it may be taken as a variety which would give its best returns when sown not later than early December. It would then have full time to reach its full growth and mature before it would be in much danger from frost. On the whole no marked difference was noticed in the ultimate growth of the next 7 varieties as named, all making very fair stalk, and cobbing well. Funk's Yellow Dent and Pride of the North showed up well as early maturing varieties, making heavy cob, but not much stalk as compared with the others. Longfellow and Ninety Day were poor both in stalk and cob. Not enough of the Blood Red variety was sown to express an opinion on its growth. What little there was showed much variability, the best being only about equal to the medium varieties. On Mr. Gwillam's plots at Croydon both Funk's Yellow Dent and Pride of the North made very good cobs at about 3 feet high. At the same date—about 100 days from sowing—the Eclipse, Hickory King, and Sibley varieties were 6 to 7 feet high and growing, Hickory King there also having the advantage a little in height and a good deal in thickness of stalk.

On one of the two plots mentioned as not having had proper working after it was sown, what thus might have proved of some value in deciding the drought-resisting properties of some of the varieties, was spoiled by the intervention of some of the dairy stock. Even this happening, however, was not without some interest as an experiment as to the more nutritious growth resulting from wide sowing as compared with broadcasting when tested by the stock themselves. Although sown a day or two later than some which had been close-drilled (broadcasted) on the adjoining land, this plot had made much the better growth of stalk at the time the cows got to it. Neglecting the broadcast crop, which grew on three sides of the wide drilled plot, the cows ate the stalks of the latter down to within a foot of the ground. As seen a few days later it looked as though the cows had been carefully herded on the drilled area, so concentrated was their work on that particular part. The only reason that can be suggested to account for the partiality of the cows for the drilled maize is that it was the sweeter feed. This would agree with botanical and chemical observations; for it is by the action of the sun's rays on the growing plant that it is enabled to build up within itself its valuable food constituents. This action is in a great measure prevented by broadcast sowing; and the weak spindly growth which usually results therefrom is of comparatively poor feeding value. Further details regarding five of these plots are herewith furnished.

(1) Mr. C. Rout, Kew, sowed 5 varieties on 2nd October, viz.—Hickory King, Solomon's Pride, Early Leaming, Sibley, and the farm sample White Horse Tooth. Of these, Hickory King and White Horse Tooth made the best growth, the former being fairly even at 6½ feet. Later sowings of the farm crop gave a growth of 9 to 10 feet.

(2) Mr. G. Hobbs, Kew, sowed six varieties on 2nd November, viz.—*Hickory King, Funk's Yellow Dent, Early Leaming, Solomon's Pride.* Longfellow, and the farm sample of Victorian Flat Red. On 25th January Yellow Dent and Flat Red were well cobbed at about 7 feet in height. In the second week in February, Hickory King was 8 to 10 feet high and cobbing. Longfellow was the poorest growth of the plot being only about 5 feet high, and fine in stalk.

(3) Mr. R. Blair made a small sowing of Hickory King, Eclipse, *Funk's Yellow Dent, Solomon's Pride, and Victorian Flat Red on 11th* November. Owing to the dry weather, there was uneven germination. With the showers in January the plot as a whole made fair growth. Funk's Yellow Dent was the first to mature at 5 feet high, and was estimated to yield at the rate of 11 tons per acre. Hickory King grew to 7½ feet and was then estimated to yield at the rate of 22 tons per acre. The other three varieties were fairly close together at about 7 feet high, and yielded at the rate of 19 tons per acre.

(4) Mr. F. B. Lithgow, of Coldstream, sowed six varieties on 17th November, viz., Hickory King, Eclipse, Solomon's Pride, Hildreth's Yellow Dent, Funk's Yellow Dent, and the farm sample which proved to be Hickory King. All grew well. Funk's Yellow Dent was the first to mature at about 6½ feet high. Hildreth's Yellow Dent matured at 8½ feet and the rest grew to an average of 9 feet throughout. Hildreth's Yellow Dent was very fine in the stalk compared with the rest; and both lots of Hickory King made the strongest comparative growth of the plot, and were the latest to mature. This plot was being kept for seed but it was blighted by a severe frost. In this test Hickory King is reported to have been also the most hardy variety.

(5) Mr. John Smith, of Cement Creek, East Warburton, sowed six varieties in the third week in November. These were Eclipse, Sibley, Hickory King, Funk's Yellow Dent, Blood Red, and Victorian Flat Red. This plot was on loose red volcanic soil high up on the range. Owing to the extremely crumbly nature of this soil very little dry weather will seriously affect any young plants. On this account the maize showed a very patchy growth. This, however, was partly remedied by diverting one of the numerous small creeks that are to be found in every valley of these mountains, and giving the ground a good soaking. The several varieties made good progress from this on, and Hickory King again made the best growth of all, running from 7 to 8 feet high. Eclipse and Sibley at 6 feet were the next best."

ELTHAM Shire.—Supervisor W. Younger reports:—

"(1) Mr. A. M. Boyd, Yarra Glen, sowed three varieties on 14th November, Hickory King, Victorian Flat Red, and Sydney White (?). The Flat Red and Hickory King grew to 10 feet high; but the Sydney White only reached 6 feet. The estimated yield of the whole crop was 20 tons per acre.

(2) Mr. D. H. Hunter, Yarra Glen, sowed Pride of the North and Hickory King on 11th November. Dry weather was experienced shortly after the crop came up; and, as it matured, two frosts occurred. Hickory King is reported to have come out the better of the two in both extremes of weather variation. The final result showed an estimated average of 12½ tons per acre for Hickory King, against 8 tons for Pride of the North. There was very little difference in the height of the two varieties."

PRESTON, YAN YEAN, and WALLAN districts.—Supervisor J. M. Kerr reports:—

"(1) Messrs. Bertram Bros., Preston, sowed four varieties on 29th October—Eclipse, Sibley, Longfellow, and Solomon's Pride. About the second week in Janauary the whole four varieties were nearly even in growth, being then about 3 feet high. Longfellow then flowered. Sibley and Solomon's Pride grew to 4½ feet; and Eclipse slightly higher. Eclipse stooled out best, and gave a very satisfactory return at the rate of 17½ tons per acre.

(2) Mrs. C. Jeffries and Sons, of South Yan Yean, sowed Hickory King, Solomon's Pride, Sibley, and Early Leaming on 25th November. Besides these, the farm sample, Sydney Red, was also sown. The Early Leaming was the first to flower, about the middle of February; and was closely followed by Sibley and Solomon's Pride, all three being about 4 feet high. Hickory King was nearly two weeks later flowering, and was then 4½ feet high. The final result was very much in favour of the Sydney Red for it weighed out equal to 22 tons per acre. Hickory King 17½ tons, Sibley 13 tons, Solomon's Pride 7 tons, Early Leaming 6½ tons.

(3) Messrs. Budd Bros., Wallan, sowed five varieties on 2nd November—Funk's Yellow Dent, Solomon's Pride, Early Leaming, Hickory King, and White Horse Tooth. Funk's Yellow Dent matured early, flowering when 4 feet high; whereas the others grew to 5½ feet. The weights gave Hickory King 10 tons per acre; Funk's Yellow Dent, Early Leaming, and Solomon's Pride about equal at 8½ tons per acre; and White Horse Tooth 5 tons.

(4) Messrs. Hurry Bros., Yan Yean, also sowed five varieties—Sibley, Early Leaming, White Horse Tooth, Longfellow, and Victorian Flat Red. On this plot, the first three named gave about equal results; but

the Victorian Flat Red was the best of all. The growth all round was comparatively poor. The Victorian Flat Red yielded about 8 tons 5 cwt.; and the other three would average about 7 tons 17 cwt. each."

Mr. Kerr comments as follows:—"One of the most satisfactory results from these demonstrations is the changing of the opinions of many farmers in this district as regards the value of drill sowing as compared with the broadcasting method. The growth of the maize on the different plots was watched critically; and the results obtained have been an effective demonstration to many. It is now apparent to those who previously doubted it, that, though under the broadcasting system in an unfavorable season a farmer may not get a return equal to the value of the seed sown, yet by the practice of drilling and intercultivation a fair crop of fodder may, with tolerable certainty, be relied on always. Although maize was sown broadcast close at hand to some of the drilled plots, in no case did its growth exceed two feet. In plot No. 1 the advantages of the Departmental system were particularly apparent. In that instance a hill top was deliberately chosen to sow on, because every attempt to get a crop of maize from that place by broadcast sowing had failed. The returns in this instance were highly satisfactory. Also on this same farm—Mr. Bertram's—the maize crop broadcasted on the rich black flats of the Merri Creek were a failure this year. On these flats in former more favorable seasons the broadcast system had given good crops. This shows that, in a bad season especially, there is only one system of maize sowing worth considering, viz., drilling, followed by intercultivation."

BROADMEADOWS and BULLA Shires.—Supervisor H. W. Budd reports:—

"(1) Mr. T. Wallbridge, Somerton, sowed four varieties on 30th October—Hickory King, Funk's Yellow Dent, Solomon's Pride, and Sydney Flat Red. The growth on the whole was fairly even, being from 5 to 5½ feet; Solomon's Pride being if anything the best. Funk's Dent stooled out fairly well. The crop was estimated to be about 6½ tons per acre.

(2) Mr. J. Twomey, Broadmeadows, sowed five varieties on 26th October—Sibley, Early Leaming, Solomon's Pride, Little Yankee, and Ninety Day. The sowing was made in two places, so a full comparison was not obtained. Sibley reached a height of 9 feet and was estimated to yield 13 tons 7 cwt. per acre.

(3) Mr. J. B. Howse, Tullamarine, sowed four varieties on 27th October—Sibley, Pride of the North, Early Leaming, and Solomon's Pride. Owing to dry weather the crop did not come up regularly, some appearing as late as 16th January. Pride of the North averaged 4 feet high; Early Leaming 4¾ feet; Sibley and Solomon's Pride about 5 feet. Sibley showed the better growth all round and the yield from it was equal to 7 tons 17 cwt. per acre.

(4) Mr. McMahon, Sunbury, sowed four varieties on 3rd December—Sibley, Eclipse, White Horse Tooth, and Longfellow. This plot had a good soaking a week previous to planting and the ground was moist. The seed therefore germinated regularly and the crop averaged a foot high inside a month from sowing. The ultimate height of each variety was Longfellow 4 feet; Sibley 6 feet; White Horse Tooth 6½ feet; and Eclipse 7 feet. Eclipse made the most successful cropping, and gave a return equal to 23 tons 11 cwt. per acre."

Mr. Budd adds:—"On the whole, it is satisfactory to be able to report that, though the season was very dry, none of the demonstration

plots were a failure. Owing to careless cultivation the same cannot be said of the general run of maize sowings in this district. Too many of the farmers leave the preparation of their maize land until just prior to sowing. This is too late. Instead of this, it should be ploughed as early as possible, say as soon as the general sowing of the hay crop is finished. It should be then worked over at intervals, so as to keep it in good condition for a satisfactory sowing of the maize crop when the proper time arrives. It is not unusual in these districts to hear a farmer excuse himself for neglecting to provide green fodder for his stock by saying that "in a good year it is not required, and in a bad year it won't grow." However, besides demonstrating that there is considerable difference between the yields from the several varieties of maize for fodder purposes, these experimental plots have served as object lessons to many farmers to prove that in a dry season, with drill sowing and proper cultivation, a profitable crop of maize can be grown here."

LITTLE RIVER and WERRIBEE districts.—Supervisor P. F. O'Bryan reports:—

"Owing to the very dry season none of the experimental maize plots sown here would be classed as a success when compared with the results obtained in more favoured districts. However, the maize on them was from 3 to 4½ feet high. Sibley, Eclipse, Hickory King, Funk's Yellow Dent, and White Horse Tooth were sown. Of these, Sibley and Hickory King showed to best advantage. Taken on the whole, Sibley was rather the best of the lot. The only lot that was weighed was the Sibley variety on Mrs. McNaughton's farm at Little River, and the yield was estimated at 7 tons 9 cwt. per acre."

SUMMARY.

Reviewing the results of these experiments the outstanding feature is the success of the Hickory King variety. Average samples of this maize were weighed on 18 plots; and the average estimated yield throughout was 21 tons 3 cwt. of green fodder per acre. Out of 41 plots of which reports have been furnished, Hickory King was grown on 33. In 21 of these it was considered to be by far the best; and in four others it divided the honours. Its yield was surpassed in only 8 plots out of the 32. Sibley with 7 firsts and Eclipse 6 firsts are those next in order of excellence. In several instances, however, these two and the Sydney and Victorian Flat Reds as well as a few others have shown up very well in comparison with Hickory King. As other new varieties become more commonly grown it is quite possible that they may prove superior even to our present best; but, as it is, even with Hickory King, a much larger quantity of seed than can at present be obtained will need to be available before this variety can be very extensively grown as a fodder crop. In many instances, therefore, it will be necessary to make use of some of the other prominent yielders just referred to.

That there is also a further variation in the growth of the several varieties under other climatic conditions is seen by referring to Mr. Lee's article in the April issue of the *Journal*. In Eastern Gippsland, where Mr. Lee's experiments were carried out, Funk's Yellow Dent, Longfellow, and Eclipse gave the heaviest returns in fodder; and Hickory King was only 7th on the list. In the drier districts in which the Dairy Supervision experiments have been carried out, the two first named, being early maturing varieties, did not show at all to advantage. For all districts Eclipse appears to be the most generally consistent yielder. However, enough proof has been brought forward by this past season's work to show that some varieties are more specially suited for each district than are

others; and from the data furnished it should be a very simple matter for each farmer to decide for himself which variety will be the most profitable for his particular farm.

The results of the experiments also demonstrate that, with the exception of a few of the earlier maturing sorts such as have been just referred to, almost any of the varieties of maize dealt with will give payable results if properly cultivated. The better the preparation of the seed bed the more evenly will the seed germinate. The more thoroughly the intercultivation of the crop is effected, the more satisfactory will be its growth. In so far as up-to-date farming is concerned the day of the broadcast system of maize-sowing is now past. Even where irrigation is practised, the system of drilling in the seed in wide rows is the best. Much seed is wasted in broadcast sowing. There is an increase in the quality of the fodder, as well as in the quantity, when the plants are given room to properly develop. Also, where the intercultivation of the crop is properly carried out, the land is cleaned of weeds which under other systems invariably make strong growth under the shelter of the maize crop. Broadcast sowing of maize for any practical purpose is more or less a waste of money; and few dairymen can afford to follow that method of farming.

THE NORTHERN SPY APPLE.

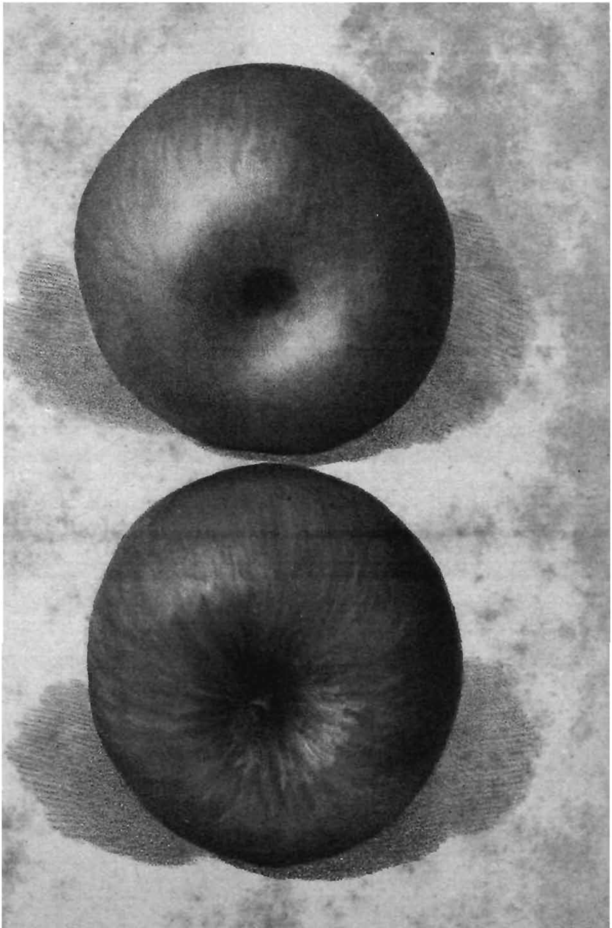
J. Cronin, Principal, School of Horticulture, Burnley.

Fruit medium to large size, roundish, conical, slightly ribbed; eye small, closed, set in a deep corrugated basin; stalk short, inserted in a shallow cavity; skin yellow on shaded side, streaked and striped with red on side, exposed to the sun; flesh yellowish white, tender and juicy, flavour rich, aromatic, very fine.

The tree is a strong, vigorous, upright grower, a shy bearer when young, but producing good crops when mature if properly pruned and managed. It is thoroughly proof against the attacks of woolly aphis, and is now generally used by nurserymen as a stock on which other varieties are budded or grafted. The apple growers of Australia, at least, are deepl indebted to the late Mr. Thos. Lang, of Ballarat, who was the discoverer of the blight-resisting qualities of this variety, and who systematically used it and the Winter Majetin as stocks for grafting in his nursery at Warrenheip. It is certain that in many districts in Victoria the culture of many of the finest varieties of apples would be most difficult, if not impossible, were it not for the use of this and other immune varieties as stocks as a preventive of the attacks of woolly aphis at the roots.

Although one of the finest dessert apples in cultivation and a fairly good keeper, this variety is not popular with orchardists on account of its tardiness in bearing profitable crops, coupled with a tenderness of the skin which bruises readily and prevents the fruit being displayed for sale in good condition, excepting under the most careful conditions of handling and transport.

In districts of heavy rainfall, and generally cool climatic conditions, woolly aphis is the worst pest of the apple grower. In commercial orchards the employment of special knowledge and special equipment keeps this pest in check, but in the gardens devoted to the cultivation of fruits for domestic use the skill and material necessary are usually absent. Under conditions suited to woolly aphis, Northern Spy is an apple that should find a place in the garden of the amateur.



NORTHERN SPY.

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The selection of kinds and varieties of fruits suitable for planting for commercial purposes in any district in the State is a comparatively easy task. Excellent articles have appeared in the section devoted to horticulture in the leading weekly papers on the results obtained by the most successful orchardists, the kinds and varieties grown that were found to be most suitable for the particular district, and the systems of cultivation, irrigation, pruning, and spraying employed in each case. Fruit-growers have undoubtedly benefited by such information, and have shown their appreciation by following in a great measure the advice deduced, or tendered. The *Journal of Agriculture* has borne its part, and the orchard inspectors have carried valuable information to places where doubts and difficulties existed, and by advice and demonstration have assisted fruit-growers in conducting their orchards on safe and profitable lines.

One of the most important changes effected has been the reduction of kinds and varieties of fruits grown, and the increase of those that are suited to the place, and the requirements of the various and most profitable markets. The problems of management have been decreased, it being much easier to learn the peculiarities and wants of a few varieties than a host, and a market for the disposal of the crop is more readily found, buyers for export or manufacture seeking the growers who have large quantities of the kind and class of fruit they require.

The average prices obtained for varieties of apples and pears in London for several years are a reliable guide to the intending planter who proposes to export his fruit, when those prices are coupled with the regularity of cropping and ease of culture, suitability to situation for the purpose, which, in addition to points respecting management, includes time of the fruit maturing. A good keeping and carrying apple that is not fit to ship by the middle of April at latest is not likely to pay as an export variety. An average price of about 9s. per case must be obtained to afford a fair profit after all expenses are paid. Cox's Orange Pippin is one of the most profitable of export apples, judging only by the prices obtained in London. Compared with Jonathan it produces about one bushel of export fruit to the three produced by Jonathan and is not as easily managed. Esopus Spitzenberg, a very fine apple, comes in the same category. Jonathan is easily the best variety to plant in the Southern districts.

For local market requirements and Inter-State shipping, the finest export varieties are always most profitable at their season, but earlier and later varieties are needed to provide a sequence from beginning of January until August and September, or later where cold storage is employed to retard maturity. The earliest apples marketed in Melbourne are grown in the Moorabbin district where the orchardists aim to produce early kinds chiefly, realizing that they cannot compete with other districts for the production of export and keeping samples. Early Margaret, Mr. Gladstone, Red Astrachan, William's Favourite, Irish Peach, and Gravenstein, are the best early varieties grown for dessert in the district named.

A selection that would provide a long succession for either market or home supply is as follows:—

Apples.—Red Astrachan, William's Favourite, Gravenstein, Emperor Alexander, Jonathan, Kentish Fillbasket, Pomme de

Neige, Cleopatra (in Northern districts), Munroe's Favourite (in Northern districts), Reinette de Canada, London (five-crown) Pippin, Rome Beauty, Stewart's Seedling, Lord Wolseley, Statesman, Rymer, Yates (in good moist soil), Rokewood.

Pears.—Williams' Bon Chretien, Howell, Beurré de Capiaumont, Beurré Bosc, Louise Bonne of Jersey, Marie Louise, Josephine de Malines, Glou Morceau, Winter Cole, Winter Nelis, Black Achan, Harrington's Victoria.

Plums.—Early Orleans, De Montford, Angelina Burdett, Diamond, Jefferson, Coe's Golden Drop, Pond's Seedling, Silver Prune, Reine Claude de Bavay, Grand Duke.

Japanese Plums.—Wright's Early, Burbank, Climax, Satsuma, Wickson, October Purple.

Peaches.—Brigg's Red May, High's Early Canada, Hale's Early, Royal George, Late Crawford, Elberta, Lady Palmerston, Wonderful.

Apricots.—Oullin's Early Peach, Campbellfield Seedling, Large Red, Moor Park, Dundonald, Royal George.

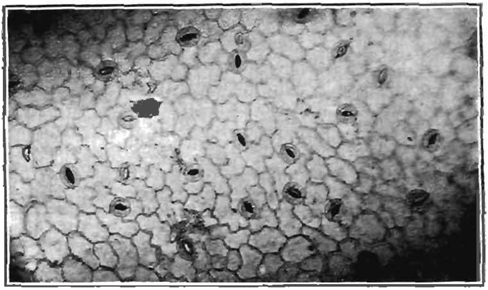
In districts fairly free from late frosts all or any of the above would thrive in a soil suitable for fruit culture. An assortment more varied in species and varieties is often found in commercial orchards where the market for the produce is a country town or district. There is no reason why a similar result should not be obtained in the orchard designed to supply fruit for home use, if the cultivator will protect his trees and their products from the ravages of insects and fungi and minister to their needs generally. Small fruits thrive in places where the larger in a great degree fail. Raspberries, currants, gooseberries, and strawberries reach perfection in elevated and cool districts but, with the exception of the latter, are totally unsuited to coastal districts slightly above sea-level, or where the soil is light and poor, or the summer temperature very high. Cherries need a cool soil and careful treatment. In some districts they are extremely hardy, while in places near by they fail under any treatment. Vines, citrus trees, and figs can also be grown in most districts, excepting those of heavy rainfall and deep rich soil, where if they grow well they generally fail to fruit satisfactorily or the sample is poor.

An American writer, Stringfellow, in a book entitled *The New Horticulture*, attacked various cultural methods universally adopted by orchardists and gardeners. He claimed among other matters that the system of planting deciduous trees with as many roots as possible was wrong, and advocated the entire removal of the roots and the head, leaving only a stub at each end. A hole sufficiently large to accommodate the stub only was also advocated, and, after planting and the soil returned, a rammer was to be used to solidify the soil. Various other cultural points were also challenged. In respect to the planting it has been admitted that he was right in a great measure, and that roots may be safely cut back to within 3 inches of the stem, the head being treated accordingly. Without knowing of the before-mentioned author or his work, the writer has practised this method of planting for many years and can vouch for its correctness.

A FUNGUS-LIKE APPEARANCE ON IMPORTED AND EXPORTED APPLE TREES.

D. McAlpine, Vegetable Pathologist.

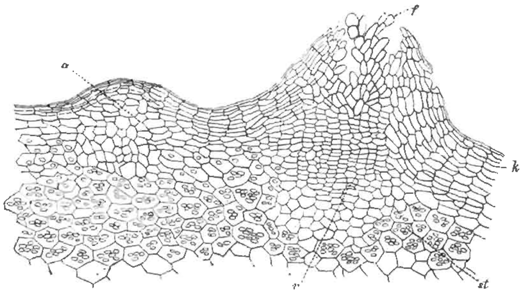
In a consignment of young apple trees, chiefly consisting of Cox's Orange Pippin, sent to this State from England, both the roots and stems were covered with a loose white powder of mealy appearance which gave the impression of the spores of a fungus and, in fact, they were submitted to me for examination in order to determine the nature of the growth. The trees arrived here on 24th May after a voyage of a little over six weeks and they were packed in straw in a tight case without any ventilation. They were inclined to be damp and the white mealy powder covering the surface turned brown, as soon as it was freely exposed to the air. On a careful examination of the stems and roots, it was seen that the outgrowths invariably arose from the numerous breathing-pores scattered all over the surface and which are known as *lenticels* from their being somewhat lens-shaped in appearance.



1. STOMATA IN EPIDERMIS.

In order to understand the appearance presented by the apple trees, it will be necessary to consider the nature of some of the contrivances which exist in plants to allow of the interchange of gases between the exterior and the interior. It is just as necessary for a plant to breathe or respire as it is for an animal, and there are numerous little openings on the surface of leaves, generally on the under surface where they are more protected, to permit of the aeration of the tissues. If the skin or *epidermis* be detached from the under surface of a Geranium leaf and examined under the microscope, it is seen to be studded all over with little openings or breathing-pores known as *stomata*, shown in Fig. 1. Each opening or stoma is composed of two sausage-shaped cells, facing each other with their concave sides and attached firmly at either end. The opening between is like a little mouth enclosed by two lips and, although each one is exceedingly minute, they make up for this by being exceedingly numerous. In some leaves, there are as many as 180,000 to the square inch and generally they are open during the day and shut at night.

But the stem and roots have contrivances for the admission of air and other gases as well as the leaves, and since the first skin or epidermis perishes and is replaced by a layer of cork, whenever they become too bulky to be sufficiently protected by a single layer of cells, as in woody branches of one year's growth, then they have a different arrangement. The corky layer is easily recognised in the Cork Oak, but it must be remembered that this substance occurs generally in plants, although it would not be regarded as such from the cork merchant's point of view; as in the skin of the potato. In many of our gum trees which are said to "shed their bark instead of their leaves," this is simply a shedding of the corky layer which has become too small for the expanding stem, and if the smooth surface beneath is scratched, even with the finger-nail, it will show the green assimilating cells which are not found inside the proper bark, as we know it, for instance, in the apple tree.



2. CROSS SECTION OF LENTICEL ON SKIN OF POTATO (AFTER SORAUER).

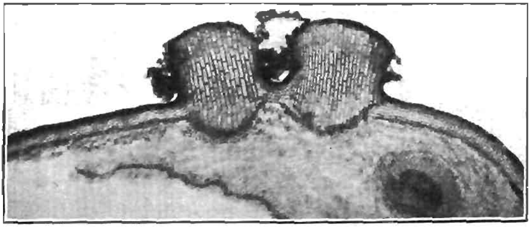
The structures found in those parts of plants invested by a corky layer, corresponding in function to the stomata in the leaves, are called *Lenticels* or Cortical pores. To the naked eye, they appear as little warts on the surface of the stem, and just as the breathing-pores of the leaves are formed from epidermal cells, so the breathing-pores of the stem are formed from cork-cells. At these spots, the cork-cells do not form an enclosed layer as they usually do, consisting of flattened cells arranged in rows one above the other, tier upon tier, as shown in Fig. 2*k*. Where a lentical occurs, the cork-cells are not firmly united together but loosely arranged, leaving small spaces between which the air has free access to the interior.

In the cross-section of the skin of a potato (Fig. 2) it is seen to be composed of cork-cells, as at *k*, beneath which are the cells containing starch grains, and at *a*, a lenticel is beginning to be formed. The cells take in moisture, swell, and cause the skin to burst, as at *f*, and the lenticel thus formed is filled with loose whitish mealy cells.

Even in normal growing plants, the white mealy appearance may occur after a long spell of wet-weather and I have seen it on the surface of potatoes in wet growing seasons. Under these conditions, the cells at *f* are multiplied excessively, they are pushed up from below, and the outer-

most cells are thrown off in the form of loose fluffy material. After this necessary preliminary explanation, it will be easy to understand the appearance presented by the imported apple trees (Fig. 4). The apple trees confined in a close box, without ventilation, and possessed of a certain amount of sap, produced an excessive amount of corky tissue at those points (lenticels) where the moisture escaped, and this swelling up and detachment of the outer loose cells as they became dry, fully explains the condition in which they arrived at the end of the voyage (Figs. 3 and 4). When planted, however, under proper conditions, they grow all right.

In the *Transvaal Agricultural Journal* for January, 1909, there is a splendid illustration of the fungus-like appearance presented by apple-tree stocks, in the form of a photograph of some sent to Pretoria from Victoria (Fig. 5). It is, however, named "Apple Tree Canker (*Nectria ditissima*, Tul.)," and in a report upon it by I. B. Pole Evans, B.A., B.Sc., F.L.S., Plant Pathologist to the Department of Agriculture there, it is stated that "The fungus (*Nectria ditissima*) was found in a consignment of 5,000 young apple trees sent to Pretoria from Melbourne, Australia. *All* the trees were infected and consequently were promptly destroyed by the

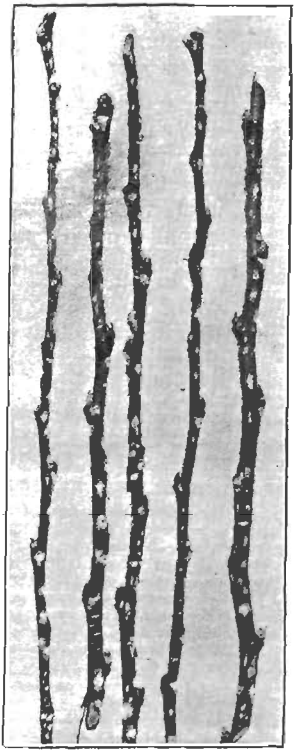


3. CROSS SECTION OF LENTICEL.

Department of Agriculture as soon as the disease was detected." If a comparison is made between the apple trees imported from Britain and the stocks exported from this State into Pretoria, there is seen to be a very close resemblance, as shown in the photographs, and when it is realized that the so-called fungus-growth is simply due to the excessive production and swelling of the corky tissues in the one case, there are reasonable grounds for supposing that it is the same in the other. It is worthy of note that in the Pretoria consignment *all* the trees were stated to be infected and when it is considered that every one of them was subject to the same conditions on the voyage, it becomes evident how they all presented a similar appearance.

A brief history of the consignment in question will now be given. There were 5,000 Northern Spy one-year-old stocks forwarded to Pretoria on 24th August of last year, 3,000 of them being 12 to 15 inches long, and 2,000, 6 to 9 inches long. They were sent in an ordinary packing-case and packed in moss obtained in the neighbourhood of the nursery. The moss was laid out in the bottom of the case to a depth of 2 inches, then a layer of stocks, above that a layer of moss, then another layer of stocks, and so on, until the case was filled. They would reach their destination in about a month from the time of shipment. It was rather late in the

season for despatching a consignment, and the development of leaves on the voyage, as shown in the photograph, indicates that a certain amount of growth took place, which would also tend to cause an excessive development



4. BRANCHES FROM IMPORTED APPLE TREES.

5. APPLE TREE STOCKS (FROM "TRANSVAAL AGRICULTURAL JOURNAL").

of the lenticels stimulated by the escaping moisture. It may be noted that the Northern Spy stock is conspicuous among other varieties for its profuse development of lenticels.

Previous consignments of similar stocks, packed in the same way, had been sent from the same nursery to Africa in 1908—6,000 on 28th June, 5,000 on 24th July, and 3,000 as late as 14th September. One consignment was also sent to England last season, and 54,000 in several consignments to New Zealand, and not a single complaint had been made, with the exception of that from Pretoria.

There is a complete system of inspection of nurseries in force in Victoria, and this is carried out by a body of trained inspectors, who have all shown their practical acquaintance with diseased conditions of fruit trees, before appointment.

I have not only personally inspected the nursery from which the apple-tree stocks were sent; but for the past nineteen years it has been my official duty to investigate the Fungi of Australia and make a complete list of them, as far as known, and although I am familiar with the fungus known as *Nectria ditissima*, Tul. in its various stages in Britain, it has never been found here on Northern Spy stock.

The simple proof of the existence of this fungus in Victoria would be the production of a specimen, but that has not been forthcoming. International courtesy, if not international law, requires that decisive proof be given of the reasons for any wholesale condemnation of diseased plants or parts of plants, and if, for instance, citrus fruits from a neighbouring State are condemned, on account of being seriously affected with Black Spot (*Phoma citricarpa*), a specimen of the fungus causing the disease is always available for examination.

As a warning against the danger of drawing conclusions from superficial appearances in the difficult domain of plant pathology, I cannot do better than quote the concluding paragraph of Pole Evans' report on the Pretoria consignment:—"The importation of this fungus(?) from Australia only serves to show how important it is that all plants from oversea and elsewhere should be examined by a *competent* officer, before they are allowed to enter this Colony, and when it is realized that these 5,000 infected(?) apple trees might have been planted in the Transvaal, if they had escaped inspection, it can hardly be wondered at that this country is already so heavily burdened with foreign pests."

REPORT ON "BITTER PIT" OF THE APPLE.

D. McAlpine, Vegetable Pathologist.

I have the honour to report, as requested, on the subject of what is commonly known in Australia as "Bitter Pit" of the apple. It is unfortunately only too well known to apple growers, both here and in other parts of the world, but it is necessary to understand clearly what is the nature of the disease to which this name is applied, in order to prevent confusion.

The common name was first given to this disease by Dr. Cobb, formerly Vegetable Pathologist to the New South Wales Department of Agriculture in 1895, although it had previously been mentioned in the *Agricultural Gazette of New South Wales* for 1892 under the heading of "Another obscure disease of the apple." The name of "Bitter Pit" was suggested, because as he remarks "The brown spots, when several are taken out and placed at once in the mouth, have an undoubted bitter taste," although he also found dead tissue between the skin and the core

which had not a bitter taste. It is also interesting to note that in connexion with the disease so named, he had seen no evidence that would prove the disease to be caused by a fungus.

The latest from America in connexion with this disease is by Brooks in the *Bulletin of the Torrey Botanical Club* for September, 1908, on "The Fruit Spot of Apples." The writer states that there are two distinct fruit spots occurring on the apple, one of which is called the "Fruit Pit" and the other the "Fruit Spot," the latter being associated with a distinct fungus.

It is the former which agrees with our "Bitter Pit," although the writer was unable to detect a bitter taste in the browned tissue. With regard to the cause and occurrence of the disease he writes:—"Microscopical examination of fruit pits have given no indication of the presence of fungi or bacteria. Brown tissue from the surface pits and from the more deeply seated vascular regions has been transferred to various culture media but always without securing bacterial or fungus growth."

Although the cause is unknown, the disease itself has characteristic symptoms and these, together with its distribution and varieties affected, will be given as a necessary preliminary to the recommendations to be made for dealing with it.

SYMPTOMS.—In some varieties the external indications appear while the fruit is still on the tree, and in others they only appear after the fruit is picked and stored. In the case of "Prince Bismarck" I have seen fully 90 per cent. of the fruit "pitted" while on the tree and in the case of Jonathans they may appear sound when shipped and the disease develops on the voyage. Whether developed on the fruit on the tree or in storage, however, there is no mistaking the appearance presented by the disease. Numerous small depressions, somewhat hemispherical in shape, usually appear on the surface of the apple, and on examining the tissue beneath these sunken areas the cells are found to be brown and shrunken thus accounting for the depressions. The spots ultimately become dark brown appearing almost black, and several of them may run together to form one large spot. This spotting of the surface is usually accompanied by an internal browning of the tissue. When the fruit is cut across numerous isolated brown spots are seen, but when carefully examined these are found to be in reality continuous strands of brown tissue surrounding the vascular bundles. The surface spots may occur without the internal browning and the disease is then sometimes distinguished as "surface pit," and the internal browning may occur without any evident surface markings. I have found both the outer and inner brown tissue to have a bitter taste when kept in the mouth for a short time, but some good observers have failed to detect it. In the case of pears the bitterness is very pronounced, resembling that of quinine.

DISTRIBUTION.—The disease known as "Bitter Pit" or "Fruit Pit" not only occurs in Australia but has been found in the United States of America, Canada and Cape of Good Hope. It is also well known in Germany where it is called "Stippen" from its supposed resemblance to the dots used in strippling by artists. In the Australian States, it has been the cause of severe losses for some years past in Victoria, New South Wales, South Australia and Tasmania, and the disease will probably become troublesome in the other States as the fruit-growing area is extended.

VARIETIES AFFECTED.—The pear and quince are known to be affected by this disease, but it is in the apple that it is best known and has done

›st serious damage. There are some varieties much more susceptible an others and there are even some which seem to escape it in one district d yet succumb to it in another. The Cleopatra, for instance, is generly regarded as one of the most susceptible, but I have found Annie izabeth, Shockley and Prince Bismarck equally bad. The following a list of varieties of apples more or less subject to this disease in ictoria :—

ınie Elizabeth	Lord Wolseley	Ribston Pippin
ıt's Head	Magg's Seedling	Rome Beauty
eopatra	Munroe's Favourite	Rymer
›x's Orange Pippin	Newtown Pippin	Scarlet Nonpareil
›opus Spitzenberg	Nick-a-jack	Shockley
ve Crown	Northern Greening	Stone Pippin
avenstein	Northern Spy	Sturmer Pippin
›over	Prince Alfred	Winter Majetin
nathan	Princess Alexandra	Yates (comparatively free)
ıte Wine	Prince Bismarck	

RECOMMENDATIONS.—Although this disease has been known for at ast 30 years, having been described in 1879 by Sorauer as occurring near erlin, and has received attention at the hands of scientists and practical owers, we are still in the dark as to the real cause of it and conseıently no means of coping with it are known. Since no definite organism ıs been found associated with it, one is led to the conclusion that it is a ›nstitutional disease and the abnormal physiological conditions may be ıe to a variety of causes. The advice to grow sorts that are not liable it is no remedy, any more than it would be a remedy to give up growing ›ples altogether in districts affected with the disease. There is no doubt to the serious losses caused by it, and this, combined with the variety opinions expressed by leading growers as to the numerous factors tendıg to produce it, renders it imperative that a thorough investigation be ndertaken to discover the cause or causes of it and the exact conditions nder which it occurs so that some means may be devised for overcoming .

Since the disease is common in several States of the Commonwealth nd as it is not one that can be properly investigated by any single State, would be the duty of a National Department of Agriculture to underıke it. But since there is no machinery at present in existence for this urpose I would strongly recommend that the different States particularly terested, viz., New South Wales, Victoria, South Australia and Tasmania ıould provide the necessary funds and appoint a skilled investigator who ould devote his whole time to an experimental study of this serious isease both in the laboratory and in the orchard. Experiments could ıen be conducted in each State and from the very nature of the disease s investigation would require the co-operation of the leading growers in ıe respective States. Every possible factor which contributes to the rowth of the tree and the formation of fruit would require to be dealt ith. The nature of the soil in which the affected trees grow, the rainall and the season, the cultivation, manuring and pruning, and even the ocks used, as Northern Spy is liable to it, would all demand attention. he chemical composition of the apple when diseased would require to e ascertained at different periods of its growth, with special reference › the sugar and acid content and the increase or decrease of tannic and ›alic acids in the cell sap. To trace this disease to its source and find a emedy for it will tax the energies of the trained specialist, and the inreasing losses due to it each year call for an exhaustive investigation ithout delay.

SHERRY: ITS MAKING AND REARING.

F. de Castella, Government Viticulturist.

Since the 16th century, "sherry" has been a household word in England and the wine known by that name, the object of a large trade with Spain. The frequent references of Shakespeare, and the praises he has made Falstaff sing of "good sherris sack" with its "twofold operation" in "King Henry IV." and elsewhere are perhaps equally convincing and certainly more picturesque than the statistics which could be quoted.

According to the Duke de Almodovar del Rio, the expedition of the Earl of Essex against Cadiz in the sixteenth century is largely responsible for the development of the sherry trade. The Spanish galleons there captured, laden with wine for the American colonies, popularized the type in England and led to its gradually replacing canary sack.

The Peninsular war and the increased intercourse between England and Spain for which it was responsible, still further stimulated the trade, which steadily increased until the sixties and seventies of the last century, which witnessed the height of the prosperity of Jerez de la Frontera, the centre of the sherry district. In or about the year 1873 vineyard land sold at up to £400 per acre, and Mostos—*i.e.*, new wines—for as much as 400 pesetas per bota or butt, equivalent to nearly 4s. per gallon. In that year the importation of sherry into England reached the total of 80,257 butts or over 8 million gallons.

The town of Jerez, though numbering only some 60,000 inhabitants, ranked as one of the richest in Spain and its prosperity was entirely due to the wine trade with England.

After this period of extraordinary prosperity a marked reaction set in and since 1880, or thereabouts, there has been a steady decline in the sherry trade with England, its principal customer, which in 1896 only imported 17,051 butts or less than a quarter of what it received in 1873—a decline which is most difficult to explain and which is probably rather due to the change of fickle fashion than to any other cause. Various explanations have been suggested but none of them are really satisfactory. The demand for cheaper wines, with the usual result of blending with wine of lower grade and consequent lowering of quality, is one. According to Don Francisco Ivison y O'Neale the average price of Sherries shipped to London has fallen from £40 per butt of 108 gallons in 1860 to £24 in 1892. The attack of Dr. Thudicum on the wholesomeness of sherry, is a good deal blamed for it locally; this will be dealt with more fully in connection with the use of plaster in the making of the wine, a practice out of which capital appears to have been made. The outbreak of phylloxera is sometimes blamed, but as this occurred in 1895, or long after the decline in trade had set in, it cannot in any way be held responsible; though it has certainly led to a reduction in production which reconstitution has not, as yet, made good.

The falling off in the demand for this wine may in certain quarters be looked upon as a blessing in disguise, for it has permitted accumulations of old wines in the bodegas of Jerez which are more than ample to maintain the quality of the wines shipped, until the produce of the new vineyards is fit to take the place of those destroyed by phylloxera. Quite recently there are symptoms of a revival in the demand for sherry. It is at any rate hoped for by those interested in the trade and certainly justified by the quality of the large existing stocks of magnificent wines.

Although it has fallen from its former high position, the present volume of trade is considerable, and the district, both on account of the quality of its wine and the special methods by which it is obtained, amply repays detailed study. Besides, the literature which exists on the subject, especially in the English language, is very limited.

The situation of the district and its methods of culture and reconstitution on phylloxera resistant stocks, have already been dealt with in the *Journal* for May, 1908. In the present article it is proposed to deal with the making of the wine and its after treatment. The varied and complex manipulations which result in the magnificent and unique wines for which Jerez de la Frontera is renowned all the world over but particularly so in English speaking countries.

It is scarcely necessary to point out that the word Sherry is a corruption of the older spelling of the name of the above town which was in former times spelt Xerez. The initial "X" being pronounced almost like "ch" in Southern Spain the English name of the wine is easily accounted for.

THE BODEGAS OF JEREZ.

Jerez has been chiefly built up by its wine trade, and the main objects of interest to visitors to the town are the bodegas of the large merchants. These are unique in their way and totally different from what one usually expects from a cellar. It will be well to endeavour to describe what these wine stores are really like and the conditions which prevail in them since these are factors which have a good deal to do with the evolution of the wine and its ultimate character.

The name "Bodega" is one, the meaning of which has become perverted in English speaking countries, where it has been adopted to designate a wine shop where a retail trade is conducted. Such distortions of meaning when a word is transplanted from one language to another are not uncommon, and the Spanish meaning in this particular case is very different to the one usually attributed to it in England.

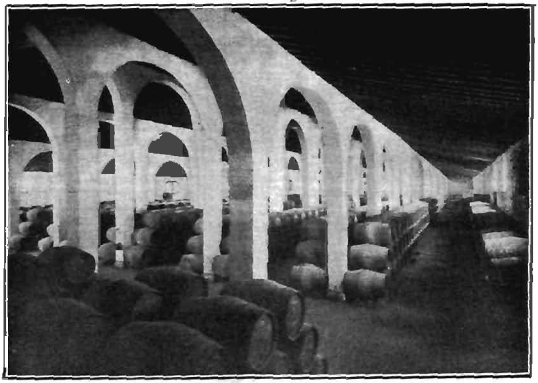
A bodega is really a cellar, or warehouse; it also means the hold of a ship, but never a retail wine shop, which in Spain is known as a *Posada* or *Parador*. A bodega is thus really a cellar, or, more strictly speaking, a wine merchant's warehouse or store, for being entirely above ground it cannot be termed a cellar. In Jerez the bodegas are one-storied buildings with a large and lofty roof of heavy tiles, usually supported by brick piers. On entry the impression created is curious. The general view reminds one more of a church than a wine store, though the tiers of butts soon dispel this first impression.

Everything in a well kept bodega, with the exception of the casks containing the wine, is kept scrupulously clean. The brick work is whitewashed every year and the clean sanded floor is raked or swept as soon as foot prints have been left by anyone's passage. The first thing that strikes one is the great height and the loss of storage space between the tops of the butts and the roof, the tiles of which contrast strangely with the whiteness of the brickwork. Another curious feature is that the casks are never cleaned. The *solera* system of handling precludes the filling or emptying of a cask. Small additions or withdrawals are made from time to time, but as a cask is never entirely emptied it can never be washed in the usual way; except in the case of an accident happening to it, it is never, after it has once been placed in position, moved. The dust which forms on the outside is respected as much as the lees in the interior, and the dingy appearance of these contrasts strangely with the marked

cleanliness of everything else about these remarkable establishments, the fundamental features of which are abundance of light and air. The great

EXTERIOR OF BODEGAS OF MESSRS. DIEZ HERMANOS.

height and massive roof prevents temperatures from becoming excessive in spite of the warmth of the climate, right in the extreme south of Spain.



INTERIOR VIEW OF PORTION OF ABOVE BODEGAS.

Nevertheless it is evident that in summer time temperatures must be far higher than in the underground cellars, in which wine is usually stored in other countries.

The size of vessel used is, with rare exceptions, the butt which usually contains from 100 to 120 gallons. From the time of pressing in the

BODEGA OF DON JOSE DE SOTO.

casa de viña, or crushing house, until the wine is shipped, it is handled exclusively in butts.

INTERIOR OF ONE OF THE BODEGAS OF DON M. DE LA RIVIERA.

Our photographs will give some idea of the outside and inside appearance of these remarkable wine stores. Messrs. Diez Hermanos' bodegas are among the largest in Jerez, whilst those of Don José de Soto are typical of medium sized, privately owned establishments.

In the palmy days of the sherry trade, specialisation of a marked type characterised the handling of the wines of Jerez—before reaching England they had gone through the hands of three distinct classes of wine men. The wine was grown, crushed, and fermented by the *cosechero*, or farmer, who, after a varying time—from a few days to a few months—sold it to the *almacenista*, or rearer, in whose bodegas it would remain until fit for the *extractor* or *exportador*, who in turn shipped it to its destination. Nowadays things are greatly changed, many of the largest houses being at the same time *cosechero*, *almacenista* and *extractor*. The tendency is for the almacenista to disappear. In more prosperous times the almacenista's stock was his banking account—fortunes were made by this class, out of the increasing values of the wines they matured. Many of them are now in a very bad state financially, being forced to sell almost at cost price the wines accumulated so laboriously many years ago. These accumulations, however, are still very considerable, and it is, thanks to the almacenistas, that there is so little danger of a shortage in the world's supply of well-matured sherry.

DRAWING A SAMPLE.

The photograph of the interior of Don M. de la Riviera's bodegas is typical of the almacenista class.

The manner in which a sample is drawn from the cask for tasting is curious, and peculiar to the district. Instead of the glass or metal "velinche" with which we are familiar, an instrument termed a *venencia* is exclusively employed. This consists of a deep, but narrow, silver cup attached to the end of a whalebone handle. It is dipped bodily into the wine, withdrawn, and its contents deftly poured into the glass, as shown in the photograph. Though simple in appearance, a good deal of knack is required, in order to avoid spilling any wine. The cellarmen of Jerez pride themselves on their dexterity in using this appliance, which has the advantage of enabling a regular, though small, sample to be taken from every cask, irrespective of the distance of the liquid from the bung.

The venencias used in the brandy cellars of Jerez, and also at San Lucar, are of a simpler form, being made entirely of bamboo, a convenient form for the replacement of a cellar tool, which only too often comes to an untimely end in our cellars.

In a general way the bodegas were remarkable for their simplicity and the absence of most modern cellar machinery and appliances. Racking is done with the bucket rather than the pump, and on the whole everything is old fashioned and quaint, though absolute cleanliness is the fundamental rule.

(To be continued.)

GOVERNMENT CERTIFICATION OF STALLIONS.

SECOND ANNUAL REPORT (SEASON 1908).

On the Veterinary Examination of Stallions for the Government Certificate of Soundness and Approval.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

The system of Government Control of Stud Horses inaugurated in 1907 was continued during the past season. Certain MODIFICATIONS OF THE CONDITIONS, dictated by experience gained during the first season, were adopted. The most important of these were foreshadowed in my first report on the working of the scheme (q.v.) It was therein stated that considerable confusion existed during 1907 as to the difference between examination of stallions for the Government certificate of soundness and approval and examination of stallions at shows subsidized by the Government. Furthermore, it was found that the possession of the Government certificate was no protection at shows against competition from uncertificated horses. The occurrence of cases in which a rejected horse was placed first by judges over certificated animals prompted the suggestion that the possession of the Government certificate should be made compulsory for competitors at shows subsidized by the Government.

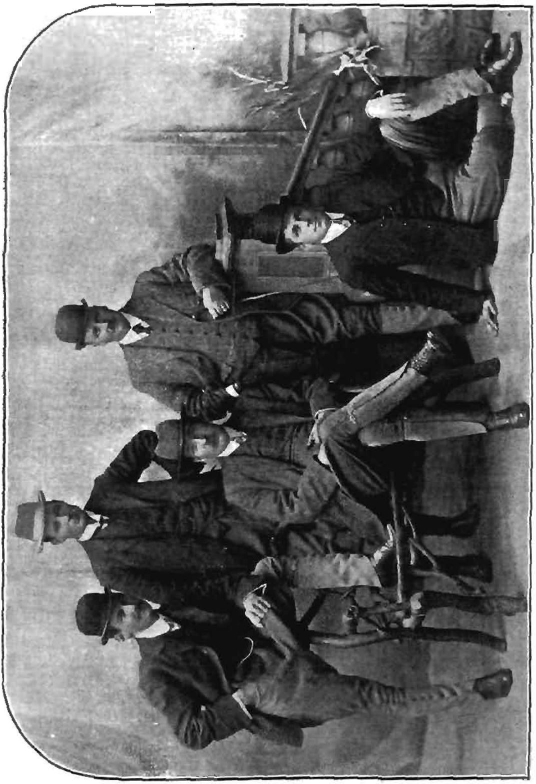
The principle of examination and Government certification had been so widely accepted by stallion owners and so extensively supported by breeders that it was felt no hardship would result from the demand that the prize-winning stallion at shows receiving Government aid should possess the Government certificate of soundness. Accordingly, it was made a condition that a Government certificate should be held in respect of all stallions three years old or over competing for prizes at shows or parades held by societies participating in the Government grant.

Another modification in a liberal direction was the provision of a regulation giving the right of appeal against the decision of the examining officer. It was thought to be only equitable, that, on the making of the condition as regards subsidized shows compulsory, it should be accompanied by some means whereby any owner who felt aggrieved at the rejection of his horse should have redress against the possible error of a single examiner. On most hands it was felt that the appeal provisions would be largely availed of, but, contrary to expectations, not a single appeal has been lodged although 253 horses have been rejected throughout the season.

Acceptance of Scheme by Societies.

In order that all societies throughout the State might be assisted in conforming with the condition for the certification of show stallions a list of parade dates and time-table was drawn up and submitted to agricultural societies throughout the State for approval. Only one society (Rochester) refused to make the suggested arrangements, and altogether 118 parades were organized by societies and attended by the Departmental veterinary officers. A notable advance towards the success of the scheme was achieved when the firms connected with the Annual Stallion Sales in

Melbourne and the Wimmera (Messrs. Campbell and Sons, Melbourne, and Messrs. *Young Bros., Horsham*) decided to sell by auction under guarantee of the Government certificate. Large numbers of horses were



VETERINARY OFFICERS ENGAGED IN THE EXAMINATION OF STALLIONS.

W. J. Colebatch, B.Sc. (Agr.), M.R.C.V.S. E. A. Kendall, G.M.V.C. J. Lyons, M.R.C.V.S. S. S. Cameron, M.R.C.V.S. (Chief Vet Officer). W. A. N. Robertson, G.M.V.C.

submitted for examination prior to these sales and it was significant of the attitude of breeders towards the scheme that few sales of uncertificated horses were effected unless at prices far below usual. Many of the

horses rejected throughout the season were exported to other States, South Australia and Queensland suffering most in this regard; so that it is no wonder that these States, as also New South Wales, have been earnestly considering ways and means of introducing and carrying out a somewhat similar system of control.

SUPPORT BY BREEDERS AND EDUCATIONAL EFFECT OF SCHEME.

As in last year's report, it is again satisfactory to record the consistent support given by the great bulk of breeders to certificated as against uncertificated horses. This has been especially the case in the Wimmera District, but throughout the State the advantage of breeding only from sound sires is much more widely appreciated than it was even a year ago. In this connexion it may be also mentioned that the educational effect of the system has been very marked. The pointed attention that has been drawn to the matter of unsoundness in horses by the veterinary examinations has quickened interest in the subject. Amongst the younger generation of horsemen especially, earnest desire has been shown to become acquainted with the various forms of unsoundness and their detection. Scope has been afforded for the spread of knowledge of the subject at the practical demonstrations given by the examining officers at the end of the parades whenever time permitted; but the greatest impetus to the acquirement of this "horse knowledge" has perhaps been given by the very excellently illustrated lantern-lecture on "Unsoundness in Horses" that has been delivered wherever possible on the evening of the parade examination. This lecture has been given in 85 different centres, and has never failed to be productive of the earnest attention of the audience and appreciative reference.

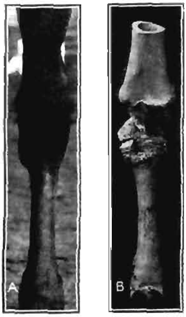
SIDEBONES ON OUTSIDE OF BOTH FORE FEET.

BONES OF SPAVINED HOCK.
A. Inside view. B. Front view. C. Outside view.

EXAMINATIONS AND REJECTIONS.

During the 1908 season 995 stallions have been examined. Certificates have been issued in respect of 742, and 253 (25.41 per cent.) have been rejected.

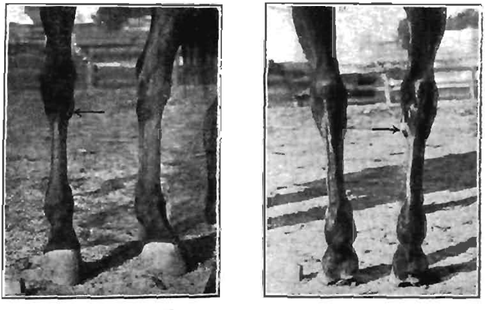
REJECTIONS FOR UNSOUNDNESS.—Of the rejections 171 (17.17 per cent.) were on the ground of hereditary unsoundness, details concerning which are given in the table below. It will be seen that, like last year, the highest percentage of rejections for unsoundness occurred amongst draught horses (27.33 per cent.) and that sidebones were again the greatest cause of rejection, 19.76 per cent. this year against 20.35 per cent. last year. The rejections in draught horses for bone spavin were the same as last year, but in the case of ringbone and bog spavin there has been an increase. In light horses there has been a decrease in the number of rejections for sidebone, bone spavin, and bog spavin, but an increase in respect of ringbone and curb. Only five pony stallions have been rejected for unsoundness this year (2.5 per cent.) as against ten last year (4.67 per cent.)



BONE SPAVIN.

A. Hock with bone spavin in living animal. B. Bones of same hock.

REJECTIONS FOR DISAPPROVAL.—The rejections on the ground of being below a reasonable standard for Government approval as regards breed, type, and conformation have been practically the same in both years—77 (8.38 per cent.) for 1907 and 82 (8.24 per cent.) for 1908. By far the largest number of rejections under this head this year have been



BONE SPAVIN IN LIVING ANIMAL.

amongst ponies—17.58 per cent. as against 8.41 per cent. last year. On the other hand, the rejections of draughts this year under this head have only been one-half (4.59 per cent.) what they were last year (8.93 per cent.). This latter circumstance is to be regretted for I feel convinced that with the present activity in draught horse breeding, unless weeding out of "Scrubber" sires takes place the State will, before many years, be loaded with an undue proportion of low type draught horses and that consequently prices, as well as the reputation of the State in this regard, will suffer a decline. It is therefore earnestly hoped that the appeal made in my last report for the adoption of means whereby there may be effected a more radical "culling" on the ground of inferiority of type will not be ignored. As then emphasized, it is not desirable, and most likely would not be acceptable to the country, that the veterinary staff should undertake the duty of selection in this regard. The requirement is for rejections on this score to be made by competent experts on the judging of the various breeds of horses—men in whom the breeding public would have the same confidence as they have shown in the veterinary staff on the matter of unsoundness.

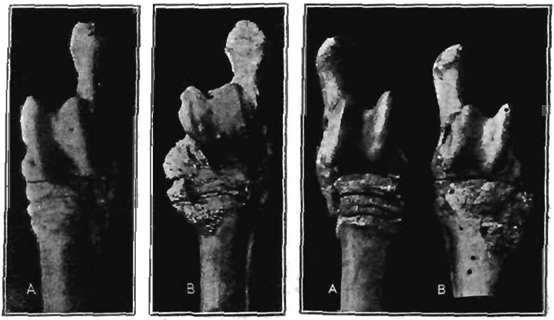
For the purposes of comparison, the table giving an analysis of the defects for which certificates were refused for 1907 is given below that for 1908.

ANALYSIS OF DEFECTS OF HORSES REFUSED CERTIFICATES, 1908.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	Number Examined. 501.	Number Certificated. 341.	Number Examined. 295.	Number Certificated. 242.	Number Examined. 199.	Number Certificated. 159.	Number Examined. 995.	Number Certificated. 742.
	Number Rejected. 160.	Percentage Rejected. 31.92.	Number Rejected. 53.	Percentage Rejected. 17.96.	Number Rejected. 40.	Percentage Rejected. 20.10.	Number Rejected. 253.	Percentage Rejected. 25.41.
Unsoundness.								
Sidebones	99	19.76	1	.33	..	..	100	10.05
Ringbones	20	3.99	7	2.37	3	1.50	30	3.01
Spavin (bone)	3	.59	8	2.71	..	..	11	1.10
Bog Spavin and Thoroughpin	15	2.99	3	1.01	..	..	18	1.80
Curb	..	..	8	2.71	2	1.00	10	1.01
Roarer	..	..	2	.67	..	..	2	.20
Totals Unsoundness	137	27.33	29	9.83	5	2.50	171	17.17
Below Standard for Approval	23	4.59	24	8.13	35	17.58	82	8.24
Grand Totals ..	160	31.92	53	17.96	40	20.10	253	25.41

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, 1907.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.
	403.	271.	301.	246.	214	186.	918.	703.
	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.
	132.	32.75.	55.	18.27.	28.	13.08.	215.	23.42.
Unsoundness.								
Sidebones	82	20.35	3	.99	..	..	85	9.25
Ringbones	9	2.23	4	1.32	2	.93	15	1.63
Spavin (bone)	3	.74	15	4.95	1	.46	19	2.06
Bog Spavin and Thoroughpin	2	.49	4	1.32	..	..	6	.65
Curb	..	..	6	1.99	6	2.80	12	1.30
Cataract (eye)	..	..	..	..	1	.46	1	.10
Totals Unsoundness	96	23.82	32	10.63	10	4.67	138	15.04
Below Standard for Approval	36	8.93	23	7.64	18	8.41	77	8.38
Grand Totals ..	132	32.75	55	18.27	28	13.08	215	23.42



BONES OF HOCK JOINT.

A. Normal. B. Bone spavin.

AGGREGATE RESULTS TO DATE—(1907 AND 1908).

So far, a total of 1,913 stallions has been examined, 1,445 having been certificated (75.58 per cent.), and 468 rejected (24.46 per cent.). Of these, 309 (16.13 per cent.) were rejected on the ground of hereditary unsoundness, and 159 (8.31) were disapproved as being below a reasonable standard for the Government certification. As regards breed, type and conformation, the detailed particulars concerning the grounds for rejection are given on the following table :—

AGGREGATE TOTALS OF DEFECTS OF HORSES REFUSED CERTIFICATES, SEASONS 1907-8.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	Number Examined. 904.	Number Certificated. 612.	Number Examined. 596.	Number Certificated. 488.	Number Examined. 413.	Number Certificated. 345.	Number Examined. 1913	Number Certificated. 1445
	Number Rejected. 292.	Percentage Rejected. 32.30.	Number Rejected. 108.	Percentage Rejected. 18.12.	Number Rejected. 68.	Percentage Rejected. 16.46.	Number Rejected. 468.	Percentage Rejected. 24.46.
UNSOUNDNESS.								
Sidebones	181 A	20.02	4 E	.67	..	..	185	9.67
Ringbones	29 B	3.20	11	1.84	5	1.21	45	2.35
Spavin (bone)	6 C	.66	23 F	3.85	1	.24	30	1.56
Bog Spavin and Thoroughpin	17	1.88	7 G	1.17	..	..	24	1.25
Curb	..	..	14 H	2.34	8	1.93	22	1.15
Cataract (eye)	..	..	..	..	1	.24	1	.05
Roarer	..	..	2	.33	..	..	2	.10
TOTALS UNSOUNDNESS	233	25.77	61	10.23	15	3.63	309	16.13
BELOW STANDARD for Approval	59 D	6.52	47 I	7.88	53 J	12.83	159	8.33
GRAND TOTALS ..	292	32.30	108	18.12	68	16.46	468	24.46

(A) 2 also "Shiverers"; 11 also affected with Ringbone; 14 also with Bog Spavin; 1 also with Bog Spavin, Ringbone, and Thoroughpin; and 1 also with Curb. (B) 1 also with Curb; and 7 also with Sidebones. (C) 1 also Bog Spavins. (D) 1 also "Shiverer"; 1 also Sidebones; and 2 also Bog Spavins. (E) 1 also Bone Spavin. (F) 1 also Curb. (G) 1 also Curb. (H) 1 also Sidebones; 1 also Bog Spavin. (I) 4 also Curbs. (J) 1 also Curb.

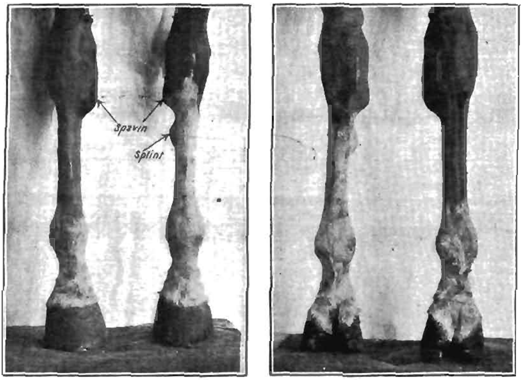
EVIDENCE OF HEREDITARY TRANSMISSION OF UNSOUNDNESS.

In my last report, particulars were furnished concerning two families of horses in which was shown to exist distinct hereditary tendency to the transmission of sidebones to progeny through generations. Of twelve descendants examined, in one case eleven were unsound, and in the other case eight out of ten descendants were unsound. Throughout the

past year, further evidence in the same direction has been forthcoming in respect of these same families and also in respect of at least one other family.

—	Descendants Examined.	Rejected for Hereditary Unsoundness.	Percentage Rejected.
Family "A"	52	23	44·2
Family "B"	43	15	34·8
Family "C"	12	7	58·3

The descendants examined include, in some cases, G.G.G. Grandsons of the original sire and there is a considerable diminution in the number of unsound descendants the further away the animal is from the original source. This in many cases is doubtless because of the influence of the introduction of sound blood on the dam's side.



FRONT AND BACK VIEWS OF HOCKS BADLY AFFECTED WITH BONE SPAVIN—ONE LIMB ALSO SHOWING SPLINT.

On the other hand, three families at least can be cited in which the preponderance of sound descendants is equally convincing of hereditary transmission of an invulnerability to development of unsoundness. In one case, eleven sons of a comparatively young sire have been examined and only one rejected (for sidebones). This one's dam traced to one of the above "unsound" families, so that the source of the "taint" in his case is obvious.

FUTURE DEVELOPMENTS.

At the 1908 Conference of the Chamber of Agriculture at Geelong, it was resolved by the unanimous vote of the whole of the delegates that it was desirable that legislation should be introduced limiting sires standing for public use to those in respect of which a Government certificate

had been issued, and that notice be given that an Act of Parliament to effect this, should be passed within five years. Since then, the feeling has grown that some action should be taken in this direction more quickly, and a conference of all the agricultural societies of the State convened by the Maryborough Society with a view of deciding on the requirements in this respect and of promoting a Bill to give effect to its recommendations, is shortly to be held.

OFFICERS.

The number of horses examined by each officer with the percentage of rejections is shown in the following table:—

OFFICERS.	STALLIONS EXAMINED.			CERTIFICATED.			REFUSED.			PERCENTAGE REFUSED.		
	1908.	*1907.*	*Total.*	*1908.*	*1907.*	*Total.*	*1908.*	*1907.*	*Total.*	*1908.*	*1907.*	*Total.*
S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer ..	185	369	554	144	270	414	41	99	140	22.16	26.82	25.27
W. J. Colebatch, B.Sc. (*Ag.*), *M.R.C.V.S.*, Assistant Chief Veterinary Officer ..	246	290	536	187	247	434	59	43	102	23.58	14.84	15.97
W. A. N. Robertson, G.M.V.C., Assistant Veterinary Officer ..	253	189	442	185	137	322	68	52	120	27.27	27.56	27.17
Norman McDonald, G.M.V.C., Assistant Veterinary Officer ..	..	70	70	..	49	49	..	21	21	..	30.00	30.00
J. Lyons, M.R.C.V.S., Assistant Veterinary Officer	150	..	150	109	..	109	41	..	41	27.33	..	27.33
E. A. Kendall, G.M.V.C., Assistant Veterinary Officer	161	..	161	117	..	117	44	..	44	27.32	..	27.32
TOTALS ..	995	918	1,913	742	703	1,445	253	215	468	25.42	25.05	24.46

I have again to thank the Officers of the Veterinary Staff for their consistent enthusiasm in carrying out the work. Half-way through the season I personally ceased conducting examinations in order that I might be left free and unprejudiced to sit on any Court of Appeal that might require to be appointed. After that, the whole of the work fell upon the other Officers, and it was no small task to get through 118 parades in the course of two months, and to maintain throughout that *savoir faire* and disregard of personal inconvenience which have so largely contributed to the success of the scheme.

S. S. CAMERON, M.R.C.V.S.,
Chief Veterinary Officer.

Department of Agriculture, April, 1909.

REGULATIONS

GOVERNING THE EXAMINATION OF STALLIONS FOR THE GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

(N.B.—Condition "A" of the conditions to be complied with by Agricultural Societies for participation in the Government grant is as follows:—

A.—That the awards of prizes in all classes for stallions three years old and over at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.)

I.—EXAMINATION PARADES.

(1) Societies within whose district an Inspection Parade is appointed are required to provide a suitable place for the examinations to be conducted, and to suitably and reasonably advertise the holding of the parade on receipt of notice from the Department of the fixture. The secretary or some member of the committee of the society is required to be in attendance at the appointed time to assist the examining officer in the arrangements for the inspection.

(2) The Parades will be conducted and the Veterinary Officer will attend without expense to Societies other than that involved in advertising and making known the occasion to the public and the Stallion owners in the district, and providing the examination ground.

(3) The Examining Officer will attend Inspection Parades held at times and places set out in the official Time Table for the year, and all examinations of Stallions for the Government Certificate will be made at such Parades or at Agricultural Shows or on some such publicly advertised occasion, *unless* under special circumstances and with the express approval of the Minister.

(4) In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time Table, notice to that effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given *not later than 1st June*, after which no alteration in the Time Table can be made.

II.—GROUNDS FOR REJECTION.

(1) Refusal of Certificate on the ground of unsoundness will be made only when in the opinion of the Examining Officer the horse is affected at the time of examination with one or more of the following hereditary unsoundnesses in any degree, viz.:—

Roaring	Curb	Thoroughpin and Bursal Enlargements
Ringbone	Bog Spavin	Nasal disease (Osteo-porosis)
Sidebone	Bone Spavin	Chorea ("Shivering" or "Nervy")

or such other hereditary unsoundness as the Minister may at any time declare. (Blemishes or unsoundness, the result—in the opinion of the Examining Officer on appearances then presented—of accident, injury, and over-strain or over-work, will not disqualify.)

(2) The Certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval, as regards type, conformation and breeding.

III.—CERTIFICATES.

(1) Particulars concerning the identity of the horse—name, breeder, pedigree, age, prior ownership, &c.—must be furnished to the Examining Officer at the time of examination. If deemed necessary in any case the owner may be called upon to furnish a statutory declaration as to the correctness of such particulars.

(2) Certificates will be issued within seven days of the holding of the Parades, and will be forwarded to the Secretaries of the Societies under whose auspices the Parades are held, and who will either forward them to the owner direct, or deliver them to him on application.

(3) Until the issue of a certificate, or until the publication of the official list of certificated stallions, the result of the Veterinary examination will not be communicated to any person except under circumstances as follow:—The Examining Officer may, on request on proper occasion, communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing, and to these only on request in writing. Secretaries of Societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless they deliver to the officer the owner's signed authority to receive the information.

(4) The Victorian Government Certificate of Soundness can only be issued in respect of horses three years old and over, that have been examined by a Victorian Government Veterinary Officer, or horses in respect of which any of the following certificates are produced:—

The New Zealand Government Certificate of Soundness,

The Veterinary Certificate of the Royal Shire Horse Society (England),

The Veterinary Certificate of Royal Agricultural Society (England).

The Veterinary Certificate of Royal Dublin Society's Horse Show (Ireland).

The Veterinary Certificate of Highland and Agricultural Society (Scotland).

The Veterinary Certificate of Glasgow and West of Scotland Agricultural Society,

Any horse which has been rejected by the Veterinary Examiners at a Show of any of the five last-named Societies is not eligible for examination for the Victorian Government Certificate of Soundness.

(5) The form of the Victorian Government Certificate of Soundness is as follows:—" E.R.—Department of Agriculture, Victoria, No. . Certificate of Soundness and Approval, issued for the season (*or issued for Life as the case may be*), given in respect of the (*breed*) stallion (*name and description of stallion*) submitted for Government inspection by the owner (*name of owner*) at (*place of examination*) such horse having been found suitable for stud service and free from hereditary unsoundness and defects of conformation predisposing thereto on examination by (*signature of Examining Officer*) Veterinary Officer on the day of 19 .

(Signature).

Chief Veterinary Officer.

Issued by direction of the Minister of Agriculture.

(Signature).

Secretary for Agriculture."

(6) Two-year-old colts may be submitted for examination and a temporary certificate will be issued in respect of such as pass the examination. Such temporary certificate must not be taken to imply suitability for stud service of approval as regards type, nor is the issue of it intended as an indication of the likelihood of a certificate being issued when submitted for examination at a more mature age.

IV.—TENURE OF CERTIFICATE.

(1) Certificates issued during the seasons 1907 and 1908 are life certificates.

(2) In 1909, only stallions *four* years old and over, will be given life certificates. *Three-year-old* stallions will be certificated for the season only, and will be required to be submitted for *re*-examination each season, *until five* years old, when a life certificate will be issued.

(3) In 1910, and subsequently, only stallions *five* years old and over, will be given life certificates. *Three-year-old* and *four-year-old* stallions will be certificated for the *season only*, and will be required to be submitted for *re*-examination each season *until five* years old, when a Life certificate will be issued.

(4) The Season certificate issued in respect of any horse must be handed to the Examining Officer at the time of re-examination or forwarded to the Chief Veterinary Officer before a subsequent Season certificate or a Life certificate will be issued.

(5) The Minister retains the right to at any time have a certificated stallion submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

(*The arrangement as to tenure of certificates, set out above, provides for the introduction of the system gradually, so that no hardship will be imposed on owners. Unless in response to Ministerial request as above provided for, owners or purchasers of stallions certificated in 1907 and 1908 will not be required to submit them again. Persons who have undertaken stallion keeping since 1908 have had ample notice and have had the fullest opportunity of making themselves aware of the conditions of certification of stallions, namely—the annual examination of all horses under five years old.*)

V.—BOARD OF APPEAL.

(1) Any owner of a stallion who is dissatisfied with the refusal of a Government certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal be in writing and be accompanied by the lodgment of £5, such amount to be forfeited in the event of the appeal *not* being upheld, unless the Board shall for good cause otherwise direct.

(*b*) That the appeal be accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Board of Appeal in connexion with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal be accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him on examination since the refusal appealed against, to be free from all the unsoundnesses set out in Part II. of these Regulations.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal be accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of fit and proper type, conformation, and breeding to be approved as a stud horse.

(2) On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Board of Appeal, which shall consist of :—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising Veterinary Surgeons.

(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Board shall act and decide on the appeal, and its decision shall be final, and *not subject to review.*

(3) In the event of the appeal being allowed, refund shall be made of the deposit, and any expenses paid by the appellant under Clause 1 (*b*). Further, the Board may recommend to the Minister the allowance of such of the expenses of the appellant in supporting his appeal as it may consider reasonable under the circumstances of the case, and the Minister may, in his discretion, confirm the recommendation in whole or in part, whereupon allowance shall be made to the appellant accordingly.

(4) No stallion in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal as herein provided for. In the event of any rejected stallion being re-submitted for examination under another name or under such circumstances as in the opinion of the Minister are calculated to mislead the Examining Officer into the belief that the horse has not previously been examined, the owner of such rejected stallion, if proved to the satisfaction of the Minister that he is responsible for such re-submission, shall be debarred from submitting any horse for examination for such period as the Minister shall determine.

LIST OF CERTIFICATED STALLIONS

(TO 31ST MARCH, 1909.)

Cert. No.	Name of Horse.	Age.*	Owner.	Parade.	Date.	Officer.
			DRAUGHTS.			
1251	Aboon the Lave ..	6 years	W. T. Cox ..	Maryborough ..	11.9.08	W.J.C.
969	Acorn	Aged	T. McNaughton ..	Cobram ..	5.8.08	E.A.K.
731	Adam Bede ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
720	Agent General ..	4 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C
737	Agitator Yet .	3 years	J. and W. Freeman	Melbourne ..	14.7.08	S.S.C.
490	Ailsa Craig .	3 years	H. M. S. Cox ..	Daylesford ..	20.9.07	W.J.C.
522	Aitkenbrae ..	Aged	Summerhill Stud Farm	Kyneton ..	26.9.07	W.R.
41	Akbar	5 years	W. F. Dorman ..	Pyramid Hill ..	3.8.07	S.S.C.
29/2	Albyn's Victor ..	2 years	Jas. Rigney ..	Ballan . ..	25.11.08	E.A.K
1069	Alderman Herod ..	3 years	J. Kearney ..	Bendigo ..	19.8.08	W.J.C.
714	Andrew Mac ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
792	Aparima Lad .	3 years	Chas. McDougall	Melbourne ..	27.7.08	W.R.
56	Ariel Prince	Aged	H. C. Robertson ..	Colac	7.8.08	S.S.C.
284	Arthur McBride	6 years	Craven Bros. ..	Tatura	24.8.07	W.R.
1210	Athol .. .	4 years	A. Mitchell ..	Casterton ..	26.8.08	W.J C.
769	Athol's Pride ..	4 years	Jas. Storach ..	Stawell ..	20.7.08	S.S.C.
174	Atlas	3 years	A. Elwell ..	Maffra ..	16.8.07	W.J.C.
599	Avondale	6 years	Jas. Harper ..	Murchison Show .	30.10.07	W.R.
313	Avondale .. .	3 years	J. Walder ..	Birchip	21.8.07	W.J.C.
976	Avondale Oak .	3 years	A. Johnson ..	Wangaratta ..	5.8.08	W.J.C.
781	Bancor's Chief	3 years	C. W. Bunbury ..	Melbourne	27.7.08	S.S.C.
610	Bar None .	3 years	D. Stewart ..	Ballarat Show ..	17.10.07	S.S.C.
735	Baron Faithful .	4 years	Jno. Burns ..	Melbourne ..	14.7.08	S.S.C.
1128	Baron Insch .	3 years	W. T. Manifold ..	Camperdown	19.8.08	J.L.
723	Baron Knight .	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
16/2	Baron Mainstay .	2 years	R. J. Wilson ..	Warrnambool .	10.9.08	W.R.
1246	Baron Mitchell .	5 years	J. P. Arandt ..	Bacchus Marsh ..	10.9.08	W.J.C.
1101	Baron Percival .	3 years	D. McDonald ..	St. Arnaud .	18.8.08	E.A.K.
727	Baron's Conqueror ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
724	Baron's Gem ..	3 years	Mitchell and O'Brien	Melbourne .	14.7.08	S.S.C.
654	Baron's Son ..	3 years	G. J. Butler ..	Maldon Show ..	30.10.07	S.S.C.
124	Barrow Admiral ..	Aged	P. J. Reid ..	Wangaratta ..	15.8.07	S.S.C.
418	Bay Style ..	3 years	W. Anderson ..	Geelong .	31.8.07	S.S.C.
142	Belted Knight ..	Aged	C. J. Cecil ..	Sea Lake .	15.8.07	N.McD.
885	Ben Douglas ..	3 years	A. W. Anderson	Melbourne ..	30.7.08	W.J.C.
794	Bengal Premier ..	3 years	A. Robertson ..	Melbourne ..	27.7.08	W.J.C.
1356	Ben Hero ..	3 years	Oliver and Son ..	Boort Show ..	30.9.08	E.A.K.
742	Ben Hur ..	3 years	Jas. Hamilton ..	Horsham ..	16.7.08	S.S.C.
1179	Ben Lomond ..	Aged	O. and M. Bodey	Ararat	7.9.08	W.J.C
293	Ben Lomond ..	5 years	J. McDonald ..	Kaniva	28.8.07	N.McD.
535	Ben More II. .	3 years	C. Hogan ..	Horsham Show ..	27.9.07	S.S.C.
996	Ben Nevis .	Aged	W. Danaher ..	Rutherglen ..	6.8.08	W.J.C.
79	Bernewang ..	Aged	W. McKnight ..	Swan Hill ..	7.8.07	W.R.
1238	Bill Squires .	3 years	E. O'Flaherty ..	Warrnambool ..	10.9.08	W.R.
729	Black Douglas ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
564	Black Heather ..	3 years	R. A. Barrett ..	Numurkah Show ..	9.10.07	W.J.C.
611	Black Knight ..	4 years	W. H. Michael ..	Ballarat Show ..	17.10.07	S.S.C.
1063	Blackwatch ..	5 years	J. Davis ..	Colac	17.8.08	W.J.C.
1222	Blockader ..	Aged	Executors of T. Brown	Hamilton ..	25.8.08	J.L.
1120	Blue Bonnet ..	6 years	Coy Bros. ..	Terang	19.8.08	J.L.
155	Blue Chief ..	Aged	A. Purcell ..	Yarrawonga ..	16.8.07	S.S.C.
21	Blythe Laddie ..	4 years	C. H. Krelle ..	Horsham ..	18.7.07	S.S.C.
743	Bonaparte .	Aged	T. Gregory ..	Horsham ..	16.7.08	S.S.C.
907	Bonnie Carlyle ..	Aged	A. Mitchell ..	Rutherglen ..	6.8.08	W.J.C.
674	Bonnie Champion ..	3 years	P. R. Hearn ..	Mansfield Show ..	21.11.07	N.McD.
957	Bonnie Doon ..	Aged	Hay Bros. ..	Numurkah ..	4.8.08	S.S.C
1253	Bonnie Doon .	4 years	G. J. Butler ..	Maryborough ..	11.9.08	W.J.C.
200	Bonnie Lad ..	Aged	J. G. Schneider ..	Hamilton .	17.8.07	W.R
1170	Bonnie Scotchman ..	Aged	Jno. Storer ..	Condah ..	26.8.08	J.L.
1339	Bonnie Shepherd ..	3 years	R. S. McKenzie ..	Numurkah Show	23.10.08	E.A.K.
162	Bonnie Star ..	3 years	J. Carroll ..	Benalla ..	17.8.07	S.S.C.

* Age is reckoned as from 1st July preceding the date of examination.

LIST OF CERTIFICATED STALLIONS—*continued*.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	DRAUGHTS—*continued*.					
199	Bonnie Style	4 years	D. Fox	Hamilton	17.8.07	W.R.
563	Bonny Bray	Aged	D. Coghill	Numurkah Show	9.10.07	W.J.C.
1351	Botanist	5 years	J. P. Morris	Yarrawonga Show	23.9.08	J.L.
998	Bothwell	Aged	J. Hiskens	Rutherglen	6.8.08	W.J.C.
848	Bounding Willow	3 years	Quinlan and McLean	Melbourne	28.7.08	W.J.C.
1034	Bounding Willow	Aged	Harry Jeltz	Rainbow	11.8.08	E.A.K.
795	Bramhope Monarch	4 years	J. E. Walters	Melbourne	27.7.08	S.S.C.
1350	British Admiral	3 years	A. Cameron	Yarrawonga Show	23.9.08	J.L.
999	Britisher	Aged	J. McCartie	Rutherglen	6.8.08	W.J.C.
197	British Lion	Aged	Habel Bros.	Hamilton	17.8.07	W.R.
184	*British Oak*	Aged	*A. Kinghorn*	*Warracknabeal*	14.8.07	W.R.
368	British Officer	Aged	— McCulloch	St. Arnaud	28.8.07	W.J.C.
153	British Wrestler	Aged	J. Ryan	Yarrawonga	16.8.07	S.S.C.
1097	Briton	Aged	S. Haire	Port Fairy	18.8.08	J.L.
1359	Briton	5 years	W. McKay	Corryong	3.10.08	E.A.K.
746	Bruce Hamilton	4 years	G. H. Hill	Horsham	16.7.08	S.S.C.
931	Brutus	3 years	McCann Bros.	Kerang	24.7.08	W.R.
445	Buckshot	Aged	A. Henderson	Warrnambool	10.9.07	W.J.C.
1183	Burns II.	5 years	T. Falls	Sale	7.9.08	W.R.
179	Cameron's Chief	Aged	— MacNab	Maffra	16.8.07	W.J.C.
34	Captain Cook	Aged	W. Bolger	Traralgon	31.7.07	S.S.C.
474	Captain Gunn	3 years	— Fisher	Morwell	16.9.07	W.J.C.
333	Capt. Seddon	4 years	H. Boyd	Elmore	26.8.07	W.J.C.
986	Carbrook	3 years	M. Ewart	Murchison	6.8.08	S.S.C.
161	Carlisle	4 years	J. C. Younger	Benalla	17.8.07	S.S.C.
226	Carnyle	6 years	F. Day	Nhill	21.8.07	S.S.C.
642	Cedric	..	J. Wallace	Pyramid Hill Show	23.10.07	W.R.
43	Celt	4 years	Jno. Ervin, sen.	Pyramid Hill	3.8.07	S.S.C.
797	Celtic Lad	3 years	A. Crystal	Melbourne	27.7.08	S.S.C.
1184	Challenger	3 years	G. and W. Lord	Sale	7.9.08	W.R.
1204	Challicum Punch	4 years	L. E. Walker	Royal Show	28.8.08	E.A.K.
1256	Champ	Aged	Jno. Young	Mildura Show	14.10.08	J.L.
1162	*Champion II.*	Aged	*P. Laydon*	*Kyabram*	24.8.08	W.R.
798	Champion Charlie	3 years	Jno. Brown	Melbourne	27.7.08	W.R.
519	Champion of the North	3 years	J. Roberts	Kyneton	26.9.07	W.R.
473	Champion Scotsman	5 years	E. Gamble	Morwell	16.9.07	W.J.C.
961	Charlie II.	4 years	C. Warren	Nathalia	3.8.08	S.S.C.
220	Charmer	4 years	F. W. Sallman	Nhill	21.8.07	S.S.C.
1279	Christmas Eve	3 years	J. T. Smethurst	Lang Lang	11.9.08	E.A.K.
964	Clan McGregor	Aged	Jas. Clark	Tungamah	4.8.08	W.J.C.
965	Clan McGregor II.	3 years	T. Lewis	Tungamah	4.8.08	W.J.C.
37	Clansman II.	5 years	H. Curran	Traralgon	31.7.07	S.S.C.
850	Clan Stewart	3 years	J. Nolan	Melbourne	28.7.08	S.S.C.
411	Clifton	4 years	H. Ross	Mansfield	30.8.07	W.J.C.
801	*Clontorf*	6 years	J. H. Harrison	Melbourne	27.7.08	W.R.
1081	Cluny's Pride	3 years	H. Curran	Traralgon	17.8.08	W.R.
37	Cluny's Style	Aged	Lewis Clark	Traralgon	31.7.07	S.S.C.
799	Clydebrae	3 years	A. Neave	Melbourne	27.7.08	S.S.C.
800	Clyde Lad	3 years	Wm. Hercus	Melbourne	27.7.08	W.J.C.
265	Clydesdale King	5 years	— Knight	Shepparton	24.8.07	S.S.C.
397	Commander	4 years	T. Creighton	Mansfield	30.8.07	W.J.C.
659	Commonwealth	5 years	G. R. McPhail	Sale Show	31.10.07	W.J.C.
1111	Commotion	6 years	Howlet Bros.	Bairnsdale	19.8.08	W.R.
328	*Cooring Chief*	*3 years*	*R. Black*	*Lilydale*	*23.8.07*	W.J.C.
1150	Corporal	3 years	Geelong Harbor Trust	Geelong	20.8.08	W.J.C.
722	Count Fascinator	3 years	Mitchell and O'Brien	Melbourne	14.7.08	S.S.C.
802	County Member	3 years	W. H. Thomson	Melbourne	27.7.08	S.S.C.
359	County Member	Aged	J. Moss	St. Arnaud	28.8.07	W.J.C.
920	Craig Albyn	4 years	K. Matheson, sen.	Birchip	21.7.08	W.J.C.
1055	Craigie Far	6 years	J. B. Marshall	Nhill	14.8.08	S.S.C.
1056	Craigie Lea II.	5 years	W. H. Treloar	Nhill	14.8.08	J.L.
419	Craigie Le Varden	5 years	T. Stiles	Geelong	31.8.07	S.S.C.
1287	Craigie Mains	4 years	Jeffrey Bros.	Whittlesea	15.9.08	J.L.
1260	Craigie's Pride	6 years	Dobson Bros.	Ballarat	11.9.08	W.J.C.
207	*Craig Lea*	*4 years*	*N. McLean*	*Minyip*	21.8.07	W.R.
1103	Crown Grant	3 years	Jno. Moss	St. Arnaud	18.8.08	E.A.K.
337	Crown Prince	6 years	D. Trewick	Elmore	26.8.07	W.J.C.
968	Crown Prince	3 years	W. E. Taylor and Sons	Cobram	5.8.08	E.A.K.
1009	Crown Prince	6 years	J. T. Murray	Alexandra	11.8.08	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—*continued.*			
719	Crown Prosecutor ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
233	Crown's Jewel ..	3 years	R. Ward ..	Nhill	21.8.07	S.S.C.
438	Dandy Dick ..	Aged	M. Ewart ..	Royal Show ..	9.8.07	S.S.C.
929	Dandy of Kunat ..	4 years	J. Roberts, jun. ..	Swan Hill ..	22.7.08	W.R.
436	Darnley's Best ..	3 years	J. Cummings, jun.	Royal Show ..	7.9.08	S.S.C.
841	Dawn of Hope ..	3 years	E. Francis ..	Melbourne ..	27.7.08	W.R.
855	Defender	3 years	Jas. Hamilton ..	Melbourne ..	28.7.08	S.S.C.
122	Diamond Prince ..	3 years	T. Hart ..	Wangaratta ..	15.8.07	S.S.C.
186	Dictate	6 years	J. Bunge ..	Warracknabeal ..	14.8.07	W.R.
712	Dictator	3 years	R. Burrows ..	Murchison ..	14.7.08	S.S.C.
439	Dingly Dell Standard Bearer	3 years	F. J. Cato ..	Agricultural Offices	10.9.07	S.S.C.
803	Don Albyn ..	3 years	Wm. Weatherley	Melbourne ..	27.7.08	J. L.
590	Donald's Pride ..	3 years	.. ..	Maryborough Show	16.10.07	S.S.C.
53	Duke of Albyn ..	Aged	L. G. Calvert ..	Colac	7.8.07	S.S.C.
145	Duke of Athol ..	5 years	M. Brown ..	Sea Lake ..	15.8.07	N.McD.
44	Duke of York ..	Aged	A. Wallace ..	Pyramid Hill ..	3.8.07	S.S.C.
1298	Dun Craig ..	5 years	J. Russell ..	Smeaton ..	17.9.08	J.L.
733	Dunedin	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
806	Dunmore	3 years	A. and J. H. Young	Melbourne ..	27.7.08	J.L.
805	*Dun Robin* ..	3 years	S. Clarke ..	Melbourne ..	27.7.08	S.S.C.
804	Dunsmore Patriarch	3 years	P. Connell ..	Melbourne ..	27.7.08	S.S.C.
1035	Earl Garthland ..	3 years	N. G. Crust ..	Rainbow ..	11.8.08	E.A.K.
933	*Earl Grey* ..	*3 years*	*McCann Bros.* ..	*Kerang*	24.7.08	W.R.
339	Earl Jock ..	4 years	D. McNamara ..	Elmore	26.8.07	W.J.C.
1001	Earl of Dalmuir ..	6 years	F. E. Peake ..	Rutherglen ..	6.8.08	W.J.C.
1247	*Earl of Darnley* ..	*Aged*	*A. Miller* ..	*Bacchus Marsh* ..	10.9.08	W.J.C.
1262	Earl of Dundonald ..	5 years	Jas. Booth ..	Ballarat ..	11.9.08	W.J.C.
1072	Earl of Roseneath ..	Aged	J. Carter ..	Bendigo ..	19.8.08	W.J.C.
988	*Eclipse*	*Aged*	*Wm. Nelson* ..	*Numurkah* ..	4.8.08	S.S.C.
807	Elderslie	3 years	H. Moss ..	Melbourne ..	27.7.08	W.J.C.
152	Everlasting ..	Aged	Jas. Clark ..	Yarrawonga ..	16.8.07	S.S.C.
28/2	Everlasting King ..	2 years	Geo. Fraser ..	Clunes	4.11.08	E.A.K.
71	Experiment ..	Aged	Shields Bros. ..	Dookie	27.7.07	W.J.C.
561	Extinguisher II. ..	4 years	Dunning and Shea	Numurkah Show	9.10.07	W.J.C.
90	Falstaff	5 years	J. Cockbill ..	Melton	10.8.07	S.S.C.
178	Farmer	6 years	G. Missen ..	Maffra ..	16.8.07	W.J.C.
475	Farmer	Aged	— Buckley ..	Morwell ..	16.9.07	W.J.C.
808	Farmer's Glory ..	3 years	A. Robertson ..	Melbourne ..	27.7.08	W.J.C.
258	Farmer's Glory ..	..	W. J. Hiles ..	Cobram ..	23.8.07	N.McD.
1230	Farmer's Pride ..	Aged	J. Carney ..	Bunyip	9.9.08	W.R.
1289	Fashion Again ..	5 years	Wm. Crozier ..	Whittlesea ..	15.9.08	J.L.
1112	Federal	Aged	J. H. Poulson ..	Bairnsdale ..	19.8.08	W.R.
1396	Federal	3 years	Geo. Nixon ..	Orbost	28.10.08	E.A.K.
789	Federal Charlie ..	4 years	Jas. Killmister ..	Melbourne ..	27.7.08	S.S.C.
268	Federal King ..	3 years	White Bros. ..	Shepparton ..	24.8.07	S.S.C.
282	Federal Prince ..	3 years	L. McLeod ..	Tatura	24.8.07	S.S.C.
54	Federal Style ..	3 years	T. T. Mulder ..	Colac	7.8.07	S.S.C.
301	Federation ..	Aged	F. Hamill ..	Maffra	16.8.07	W.J.C.
1352	Fitz Lion	4 years	E. J. Lewis ..	Yarrawonga Show	23.9.08	J.L.
112	Flashwood ..	3 years	Dean Bros. ..	Euroa	14.8.07	S.S.C.
294	Flashwood ..	Aged	Meyer Bros. ..	Kaniva	28.8.07	N.McD.
364	*Forest Chief* ..	*3 years*	*D. W. Stewart* ..	*St. Arnaud* ..	28.8.07	W.J.C.
698	Forester	6 years	H. C. Lees ..	Tallangatta Show	5.3.08	W.J.C.
109	Forest Hill ..	5 years	Balmattum District Horse Breeders' Association	Euroa	14.8.07	S.S.C.
362	*Fortune Teller* ..	*5 years*	*— Stephens* ..	*St. Arnaud* ..	28.8.07	W.J.C.
96	Gallant Lad ..	3 years	J. Hamilton ..	Murtoa	9.8.07	W.J.C.
1018	Gallant Lad ..	3 years	A. Mitchell ..	Hopetoun ..	13.8.08	W.R.
123	*Gallant Lad* ..	*Aged*	*E. Land* ..	*Wangaratta* ..	15.8.07	S.S.C.
1332	Gallant Scotchman	Aged	A. Skirving ..	Warragul ..	24.9.08	W.R.
1240	General Gordon ..	3 years	R. J. Wilson ..	Warrnambool ..	10.9.08	W.R.
398	General Grant ..	Aged	T. Creighton ..	Mansfield ..	30.8.07	W.J.C.
1012	General Hamilton ..	3 years	Robt. Crafter ..	Minyip	12.8.08	W.R.
518	General McClelland..	Aged	Healey and Harwood	Kyneton ..	26.9.07	W.R.
592	Gladbrook ..	6 years	Tippett Bros. ..	Maryborough Show	16.10.07	S.S.C.
858	Gladiator	3 years	J. R. Stokes ..	Melbourne ..	28.7.08	W.R.
728	Gladiator	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
35	Glancer	Aged	W. Bolger ..	Traralgon ..	31.7.07	S.S.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—*continued.*			
111	Glencoe ..	Aged	Jno. Hewlett ..	Euroa ..	14.8.07	S.S.C.
1286	Glencoe ..	Aged	David Lindsay ..	Wangaratta Show	15.9.08	E.A.K.
591	Glen Dhu ..	3 years	J. R. Stokes ..	Maryborough Show	16.10.07	S.S.C.
779	Glenfield ..	4 years	J. Roberts ..	Charlton ..	23.7.08	W.J.C.
19	Glengarry ..	4 years	H. O. Daniel ..	Horsham ..	18.7.07	S.S.C.
1299	Glen Lea ..	Aged	J. and J. Russell	Smeaton ..	17.9.08	J.L.
1214	Glen Lee ..	3 years	C. Milburn ..	Casterton ..	26.8.08	W.J.C.
916	Glenlee ..	4 years	D. Lang ..	Charlton ..	23.7.08	W.J.C.
18/2	Glen Luce ..	2 years	M. M. Muir	Bacchus Marsh ..	10.9.08	W.J.C.
292	Glenoak ..	Aged	C. Wallis ..	Kaniva ..	28.8.07	N.McD.
677	*Golden Gift* ..	*3 years*	*Wm. Foubister* ..	*Kyneton Show* ..	*26.11.07*	W.R.
860	Gold Top ..	3 years	J. Lowden ..	Melbourne ..	28.7.08	W.J.C.
326	Gordon Lad ..	Aged	W. J. Murray ..	Lilydale ..	23.8.07	W.J.C.
1	Governor General ..	Aged	Jas. Scott ..	Korumburra ..	29.9.06	S.S.C.
750	Grand Style ..	6 years	C. Krelle ..	Horsham ..	16.7.08	S.S.C.
370	Halswell ..	3 years	Dyke Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
810	Halyard ..	3 years	Thos. Bookless ..	Melbourne ..	27.7.08	W.J.C.
315	*Hamilton Hero* ..	*3 years*	*H. McLure* ..	*Birchip* ..	*21.8.07*	W.J.C.
1019	Hamiltonian ..	3 years	C. Waser ..	Hopetoun ..	13.8.08	W.R.
738	Harry Lauder ..	3 years	J. and W. Freeman	Melbourne ..	14.7.08	S.S.C.
399	Hawthorn's Pride ..	3 years	W. J. Taylor ..	Mansfield ..	30.8.07	W.J.C.
1045	Heart of Oak ..	Aged	C. W. Thomas ..	Jeparit ..	13.8.08	E.A.K.
257	Heather Jock ..	3 years	S. M. Brown ..	Cobram ..	23.8.07	N.McD.
1/2	Heather Lad ..	2 years	Geo. A. McKoy ..	Melbourne ..	29.7.08	W.J.C.
33	*Herald Lad* ..	3 years	L. Roach ..	Traralgon ..	31.7.07	S.S.C.
151	Hercules ..	4 years	P. Keenan ..	Yarrawonga ..	16.8.07	S.S.C.
1025	Herd Lad ..	3 years	J. Williams ..	Romsey ..	14.8.08	W.J.C.
957	*Herdsman* ..	Aged	Alex. Colvin ..	Nathalia ..	3.8.08	S.S.C.
1159	Herod's Boy ..	3 years	Thos. Manning ..	Daylesford ..	21.8.08	E.A.K.
344	Herod's Knight ..	3 years	E. J. Beer ..	Echuca ..	24.8.07	W.J.C.
925	Hero Laddie ..	4 years	T. A. Kendall ..	Kerang ..	24.7.08	W.R.
1362	Hiawatha ..	4 years	A. L. Hamilton ..	Corryong ..	3.10.08	E.A.K.
861	Highland Jock ..	5 years	G. Ritchie ..	Melbourne ..	28.7.08	J.L.
344	Highland Sandy ..	4 years	J. Crawford ..	Echuca ..	24.8.07	W.J.C.
73	*His Majesty* ..	*4 years*	*Geo. Jackson* ..	*Dookie* ..	27.7.07	W.J.C.
381	Honest Ben ..	3 years	C. Ley ..	Casterton ..	28.8.07	W.R.
751	Honest Lad ..	4 years	R. Ward ..	Horsham ..	16.7.08	S.S.C.
18	Ian Lad ..	3 years	P. Hamilton ..	Horsham ..	18.7.07	S.S.C.
520	Ian McDougall ..	5 years	B. Benton ..	Kyneton ..	26.9.07	W.R.
1042	Ian Russell ..	5 years	W. Moll ..	Dimboola ..	12.8.08	E.A.K.
713	Imperial King ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
365	Imperial Prince ..	4 years	Batten Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
305	Irish Hero ..	6 years	E. Spinks ..	Wycheproof ..	20.8.07	W.J.C.
1057	*Jack Macduff* ..	4 years	J. Dufty and Sons	Nhill ..	14.8.08	J.L.
23	Jack of Hearts ..	6 years	J. H. Gressels ..	Horsham ..	18.7.07	S.S.C.
255	Jock ..	Aged	Wm. Williams ..	Cobram ..	23.8.07	N.McD.
24	John Ballance ..	Aged	R. H. B. Guest ..	Horsham ..	18.7.07	S.S.C.
752	Kaid Maclean ..	3 years	Jos. Taylor ..	Horsham ..	16.7.08	S.S.C.
422	Keithdale ..	5 years	W. Mitchell ..	Geelong ..	31.8.07	S.S.C.
1058	Kelmscott ..	6 years	Jno. Bateson ..	Nhill ..	14.8.08	E.A.K.
1407	*Kelso* ..	*4 years*	*H. Alan Currie* ..	*Camperdown* ..	*26.11.08*	E.A.K.
74	Kelvin Craig ..	Aged	Jno. McDougall ..	Dookie ..	29.7.07	W.J.C.
171	Kelvin Grove ..	4 years	A. M. Foster ..	Maffra ..	16.8.07	W.J.C.
1007	Kelvin Lad ..	3 years	C. Krelle ..	Murtoa ..	11.8.08	W.R.
358	Kenwyn Jock ..	4 years	Jas. Barry ..	St. Arnaud ..	28.8.07	W.J.C.
785	*Khandahar* ..	3 years	*C. H. Wilmott* ..	*Melbourne* ..	27.7.08	S.S.C.
812	Khandahar ..	3 years	A. C. Ross ..	Melbourne ..	27.7.08	W.R.
314	*Kilmore* ..	*Aged*	*A. P. Jones* ..	*Birchip* ..	*21.8.07*	W.J.C.
222	Kinlock ..	4 years	W. T. Bodey ..	Nhill ..	21.8.07	S.S.C.
753	Kintyre ..	Aged	Otto Maroske ..	Horsham ..	16.7.08	S.S.C.
869	Knight Commander	3 years	R. T. Anderson ..	Melbourne ..	28.7.08	W.R.
786	Knight of Waihi ..	3 years	J. D. Mitchell ..	Melbourne ..	27.7.08	S.S.C.
814	Knight Royal ..	3 years	D. Davies ..	Melbourne ..	27.7.08	W.J.C.
345	King Albyn ..	5 years	J. Rousch ..	Echuca ..	28.8.07	W.J.C.
230	King Ben ..	Aged	W. Mill ..	Nhill ..	21.8.07	S.S.C.
813	King Duncan ..	3 years	E. Leydon ..	Melbourne ..	27.7.08	W.J.C.
1245	King Edward ..	Aged	Wilson Bros. ..	Wangaratta ..	4.9.08	E.A.K.
514	*King of the Valley* ..	*3 years*	*D. J. Murphy* ..	*Elmore Show* ..	*25.9.07*	W.R.
839	Laird of Bothwell ..	3 years	Caffrey and Murphy	Melbourne ..	27.7.08	S.S.C.
22/2	Laird of Burnbrae ..	2 years	Wm. Cameron ..	Melton ..	18.9.08	J.L.
1093	Laird of Cluny ..	Aged	H. Wright ..	Shepparton ..	22.8.08	W.J.C.
1186	Laird of Irwell ..	3 years	G. and W. Lord ..	Sale ..	7.9.08	W.R.
572	Laird of Lanark ..	3 years	P. Rogers ..	Dimboola Show ..	11.10.07	S.S.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—*continued.*			
870	Laird of Mar ..	3 years	Caffrey and Murphy	Melbourne ..	28.7.08	S.S.C.
26/2	Laird o' Struan ..	2 years	J. M. Stewart ..	Casterton ..	26.8.08	W.J.C.
1369	Laird of the Mains ..	Aged	Grace and Fletcher	Ballarat ..	5.10.08	W.J.C.
1280	*Lancer*	*6 years*	*R. N. Herkes* ..	*Lang Lang* ..	*11.9.08*	*E.A.K.*
448	Lauderdale ..	Aged	Jas. Jenkins ..	Warrnambool ..	10.9.07	W.J.C.
815	Laudermark ..	5 years	J. E. and M. Walters	Melbourne ..	27.7.08	S.S.C.
580	Law Suit	3 years	A. Crictenden ..	Jeparit Show ..	16.10.07	W.J.C.
1302	Liberator	Aged	J. and J. Russell ..	Smeaton ..	17.9.08	J.L.
245	Lion	4 years	H. J. Alford ..	Yarram ..	21.8.07	N.McD.
97	Little Wonder ..	4 years	A. C. Petrass ..	Murtoa ..	9.8.07	W.J.C.
1164	Lochiel	4 years	J. T. Ovens ..	Kyabram ..	24.8.08	W.R.
110	*Lochiel's Champion*	*5 years*	*Ryan and Cooper*	*Euroa*	*14.8.07*	*S.S.C.*
816	Lochinvar ..	5 years	Jno. Small ..	Melbourne ..	27.7.08	S.S.C.
322	Locknaw Hero ..	Aged	D. Syme ..	Lilydale ..	23.8.07	W.J.C.
492	Lonsdale ..	3 years	Cooper Bros. ..	Stawell Show ..	18.9.07	W.R.
1031	Lord Benmore ..	Aged	D. Johns ..	Beulah	13.8.08	W.R.
1303	Lord Carrick ..	4 years	J. Sewell ..	Smeaton ..	17.9.08	J.L.
701	Lord Clifford ..	4 years	A. E. Schotz ..	Tallangatta Show	5.3.08	W.J.C.
872	Lord Clyde ..	5 years	A. Williams ..	Melbourne ..	28.7.08	W.J.C.
817	Lord Clyde ..	3 years	Jno. McDonald ..	Melbourne ..	27.7.08	W.J.C.
818	Lord *Cranbourne II.*	Aged	O. and M. Bodey	Melbourne ..	27.7.08	S.S.C.
1037	Lord Darnley ..	5 years	D. McMillan ..	Rainbow ..	11.8.08	E.A.K.
696	Lord Dean ..	5 years	W. D. Taylor ..	Lilydale Show ..	4.3.08	W.R.
1059	Lord Derby ..	3 years	M. Rees ..	Nhill	14.8.08	E.A.K.
928	Lord Douglas ..	3 years	J. Hickey ..	Swan Hill ..	22.7.08	W.R.
608	Lord Dunbar ..	3 years	J. J. Downie ..	Ballarat Show	17.10.07	S.S.C.
1191	Lord Dundonald* ..	Aged	E. J. Rickey ..	Royal Show ..	28.8.08	J.L.
609	Lord Dunkeld ..	3 years	Mrs. Sutherland ..	Ballarat Show	17.10.07	S.S.C.
558	Lord Dunmore ..	3 years	D. McKinnon ..	Wycheproof Show	4.10.07	W.R.
1307	Lord Edward ..	Aged	Jas. McMurray ..	Melton	18.9.08	J.L.
788	Lord Erskine ..	3 years	W. Thompson ..	Melbourne ..	27.7.08	S.S.C.
1304	Lord Hermiston ..	4 years	R. Cowie ..	Smeaton ..	17.9.08	J.L.
42	Lord Hopetoun ..	Aged	J. E. Morgan ..	Pyramid Hill ..	3.8.07	S.S.C.
144	Lord Hopton ..	Aged	G. A. Neville ..	Sea Lake ..	15.8.07	N.McD.
1325	Lord Lyon ..	3 years	J. McLure and Son	Kyneton ..	24.9.08	W.J.C.
819	Lord Marconi ..	3 years	Martin Egan ..	Melbourne ..	27.7.08	S.S.C.
691	Lord McDonald ..	4 years	Wm. Foubister ..	Bunyip Show ..	26.2.08	W.R.
820	Lord Montrave ..	3 years	Wm. Crozier ..	Melbourne ..	27.7.08	W.J.C.
732	Lord Mount Stephen	3 years	Jno. Dixon ..	Melbourne ..	14.7.08	S.S.C.
231	Lord Percy ..	3 years	M. Mills ..	Nhill	21.8.07	S.S.C.
787	Lord Roberts ..	Aged	P. Moreland ..	Melbourne ..	27.7.08	S.S.C.
348	Lord Roberts ..	5 years	Thos. Fulham ..	Echuca	24.8.07	W.J.C.
417	Lord Ronald ..	5 years	A. W. Warren ..	Geelong ..	31.8.07	S.S.C.
304	*Lord Stanley* ..	*Aged*	*W. Harty, sen.* ..	*Wycheproof* ..	*20.8.07*	*W.J.C.*
585	Lord Wallace ..	3 years	E. J. Rickey ..	Maryborough Show	16.10.07	S.S.C.
1046	Lowland Oak ..	Aged	G. Eldridge ..	Jeparit	13.8.08	J.L.
993	Lucky Willie ..	3 years	Carroll Bros. ..	Euroa	7.8.08	W.J.C.
533	Lucky Willie ..	6 years	Otto Maroske ..	Horsham Show ..	24.9.07	S.S.C.
1050	Ludham Mainstay* ..	Aged	R. McKenzie ..	Warracknabeal	14.8.08	W.R.
267	MacArthur Again ..	Aged	A. Kennedy ..	Shepparton ..	24.8.07	S.S.C.
782	Macdonald ..	3 years	Jno. Brown ..	Melbourne ..	27.7.08	S.S.C.
587	MacDonald ..	3 years	G. Porteous ..	Maryborough Show	16.10.07	S.S.C.
146	*Mafeking* ..	*3 years*	*P. Gottschutzke* ..	*Sea Lake* ..	*15.8.07*	*N.McD.*
49	Magnet	Aged	W. A. Mitchell ..	Hopetoun ..	3.8.07	W.J.C.
160	Major General ..	4 years	D. Kenneally ..	Benalla ..	17.8.07	S.S.C.
1248	Major General ..	3 years	L. Dugdale ..	Bacchus Marsh ..	10.9.08	W.J.C.
1290	Major John ..	4 years	Cornellia Estate ..	Echuca	15.9.08	W.R.
663	Major MacDonald ..	5 years	G. and W. Lord ..	Traralgon Show	13.11.07	W.R.
1165	*Major Mills* ..	*5 years*	*J. Bail and Sons* ..	*Kyabram* ..	*24.8.08*	*W.R.*
560	Major Robin ..	Aged	J. C. Rockliffe ..	Numurkah Show	24.10.07	W.J.C.
1087	Major Taylor ..	5 years	J. H. Meyer ..	Kaniva	15.8.08	E.A.K.
108	*Marcellus*	*4 years*	*W. Cavanagh* ..	*Euroa*	*14.8.07*	*S.S.C.*
879	Marion's Champion	4 years	G. W. Barnett ..	Melbourne ..	29.7.08	W.R.
734	Mark Time ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
961	Marquis of Albyns ..	Aged	Jas. Tyers ..	Numurkah ..	4.8.08	S.S.C.
154	Marquis of Boorol ..	3 years	McPherson Bros.	Yarrawonga ..	16.8.07	S.S.C.
1249	Marshall Hard Times	4 years	D. Robertson ..	Bacchus Marsh ..	10.9.08	W.J.C.
1192	Master Carmyle ..	3 years	J. Ellis ..	Royal Show ..	28.8.08	J.L.
232	Matchless Oak ..	Aged	A. E. and W. H. Sambell	Nhill	21.8.07	S.S.C.
893	May King* ..	3 years	J. Bagnall ..	Melbourne ..	28.7.08	S.S.C.
821	Merry Tom ..	3 years	Harrison and Hastie	Melbourne ..	27.7.08	W.J.C.

* Dead.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—continued.			
822	Middlerigg Royal Ensign	3 years	J. Bourke ..	Melbourne ..	27.7.08	W.J.C.
823	Middlerigg Royal Oak	3 years	E. Moreton ..	Melbourne ..	27.7.08	W.R.
875	Middlerigg Royal Salute	3 years	— Waggon ..	Melbourne ..	27.7.08	W.R.
927	Millfield	Aged	W. Hercus ..	Pyramid Hill ..	23.7.08	W.R.
1166	Model	Aged	Jno. Mills ..	Kyabram ..	24.8.08	W.R.
511	Model	6 years	A. J. Bodey ..	Camperdown ..	26.9.07	W.J.C.
75	Model	3 years	W. G. Down ..	Dookie ..	27.7.07	W.J.C.
312	*Model*	*Aged*	*P. J. Grogan* ..	*Birchip* ..	*21.8.07*	*W.J.C.*
894	Model Oak ..	6 years	Jas. Hamilton ..	Melbourne ..	28.7.08	S.S.C.
725	Money More ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
683	Montrave ..	3 years	J. Wheelan ..	Korumburra Show	22.1.08	W.R.
400	Native Blue ..	Aged	S. Doak ..	Mansfield ..	30.8.07	W.J.C.
447	*Native Prince* ..	*Aged*	*J. Clements* ..	*Warrnambool* ..	*10.9.07*	*W.J.C.*
1021	Navy Blue ..	Aged	H. Jenkins ..	Hopetoun ..	13.8.08	W.R.
287	Near the Mark ..	5 years	W. Hicks ..	Kilmore ..	27.8.07	S.S.C.
543	Neil Gow	3 years	J. Hamilton ..	Horsham Show ..	27.9.07	S.S.C.
886	Newton Stewart ..	3 years	Jos. Brunton ..	Melbourne ..	30.7.08	W.J.C.
895	Nipper	Aged	J. McLeod ..	Melbourne ..	28.7.08	W.R.
1335	*North King* ..	*Aged*	*E. Elliott* ..	*Warragul* ..	*24.9.08*	*W.R.*
1141	Oak Branch ..	Aged	F. J. Quick ..	Werribee ..	21.8.08	J.L.
824	Oakhurst	3 years	McLauran Bros. ..	Melbourne ..	27.7.08	W.J.C.
308	O'Connell's Pride ..	3 years	J. P. Billeville ..	Birchip ..	21.8.07	W.J.C.
1144	Old Type ..	Aged	A. McKenzie ..	Werribee ..	21.8.08	J.L.
709	Onward	3 years	Jas. Phillips ..	Melbourne ..	14.7.08	S.S.C.
721	Orari	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
225	Orbost	6 years	F. G. Allen and Son	Nhill	21.8.07	S.S.C.
1308	Papakaio	6 years	Robt. Watson ..	Melton	18.9.08	J.L.
189	Pearlstone ..	4 years	Fred. Walsh ..	Melton	10.8.07	S.S.C.
756	Percy	3 years	Jas. Hamilton ..	Horsham ..	16.7.08	S.S.C.
1114	Playmate ..	5 years	P. D. Hanley ..	Bairnsdale ..	19.8.08	W.R.
1296	Preferential ..	Aged	Mrs. Hugh Rae ..	Lilydale ..	17.9.08	E.A.K.
32	Premier Prince ..	4 years	J. D. Rathgin ..	Traralgon ..	31.7.07	S.S.C.
825	Present Times ..	3 years	J. L. Oliver and Sons	Melbourne ..	27.7.08	W.J.C.
349	President	4 years	J. McLeod ..	Echuca	24.8.07	W.J.C.
1265	President	3 years	G. Eason ..	Ballarat ..	11.9.08	W.J.C.
130[illegible]	Pride of Garthlands	4 years	Robt. Watson ..	Melton	18.9.08	J.L.
1086	Pride of Moe ..	5 years	R. H. Gibson ..	Traralgon ..	17.8.08	W.R.
826	Pride of Moira ..	3 years	Falkiner and Sons	Melbourne ..	27.7.08	W.R.
1318	Pride of Springfield	4 years	J. B. Howe ..	Inglewood ..	18.9.08	W.R.
329	Pride of the Hills ..	4 years	J. Taylor ..	Lilydale ..	23.8.07	W.J.C.
420	Pride of the Hills ..	Aged	R. McDonald ..	Geelong ..	31.8.07	S.S.C.
413	Pride of the Park ..	4 years	Trustees Barwon Park	Geelong ..	31.8.07	S.S.C.
1154	Pride of the Ponds	3 years	E. Drayton ..	Geelong ..	20.8.08	J.L.
181	Pride of the Walk ..	..	T. Pollock ..	Maffra	16.8.07	W.J.C.
1289	Pride of Yarram ..	5 years	Barlow and Richards	Yarram ..	9.9.08	J.L.
504	Prince Again ..	3 years	D. J. Ferguson ..	Seymour Show ..	11.10.07	W.J.C.
19/2	Prince Albert II. ..	2 years	F. Berger ..	Maryborough ..	11.9.08	W.J.C.
1137	Prince Albyn ..	3 years	D. McDonald ..	Donald	19.8.08	E.A.K.
291	Prince Arthur ..	Aged	F. Quire ..	Kaniva	28.8.07	N.McD.
1226	*Prince Bonnie* ..	..	*H. Miller* ..	*Sale*	*7.9.08*	*W.R.*
288	Prince Champion ..	4 years	McManus Bros. ..	Kilmore ..	27.8.07	S.S.C.
508	Prince Charlie ..	Aged	J. Taylor ..	Camperdown ..	26.9.07	W.J.C.
256	Prince Clyde ..	Aged	W. E. Taylor ..	Cobram ..	23.8.07	N.McD.
757	Prince Henry ..	Aged	M. Carmichael ..	Horsham ..	16.7.08	S.S.C.
350	Prince Imperial ..	3 years	D. Murphy ..	Echuca	24.8.07	W.J.C.
1131	*Prince Juno* ..	*4 years*	*W. T. Manifold* ..	*Camperdown* ..	*19.8.08*	*J.L.*
283	Prince of Albyn ..	Aged	J. Wilson ..	Tatura	24.8.07	W.R.
332	Prince of Avondale ..	Aged	— McGregor ..	Elmore	26.8.07	W.J.C.
57	Prince of Hearts ..	6 years	Jos. Phalp ..	Colac Show ..	7.8.07	S.S.C.
22	Prince of Kyle ..	Aged	Jno. Bushby ..	Horsham ..	18.7.07	S.S.C.
269	Prince of Lorne ..	5 years	R. Young ..	Shepparton ..	24.8.07	S.S.C.
307	Prince of Oaklands	4 years	M. J. Ryan ..	Wycheproof ..	20.8.07	W.J.C.
185	Prince of the Clans ..	6 years	J. Annison ..	Warracknabeal ..	14.8.07	W.R.
1115	Prince of Wales ..	Aged	F. E. Coster ..	Bairnsdale ..	19.8.08	W.R.
784	Prince of Kyle ..	3 years	A. Blaikie ..	Melbourne ..	27.7.08	S.S.C.
874	Prince Royal ..	4 years	Otto Maroske ..	Melbourne ..	28.7.08	S.S.C.
1043	Prince William ..	3 years	J. Elsom ..	Dimboola ..	12.8.08	E.A.K.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—*continu d.*			
347	Prince York ..	3 years	W. G. Freeman	Echuca	24.8.07	W.J.C.
453	Rainbow	..	G. Ritchie ..	Warrnambool ..	10.9.07	W.J.C.
710	Ranfurley's Hero ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
1169	Rendlesham Daisy Boy	5 years	Groongal Pastoral Coy.	Royal Show ..	2.9.08	J.L.
1358	Retainer	6 years	D. Blair ..	Boort Show ..	30.9.08	E.A.K.
319	Ribbon Wood ..	5 years	Hugh McLaren ..	Lilydale ..	23.8.07	W.J.C.
555	Right Bower ..	Aged	D. Blair ..	Wycheproof Show	4.10.07	W.R.
534	Robert Charters ..	3 years	Ralph Guest ..	Horsham Show ..	24.9.07	S.S.C.
882	Robin	3 years	J. D. Mitchell ..	Melbourne ..	30.7.08	W.R.
685	Robin	4 years	C. Simons ..	Leongatha Show	11.2.08	S.S.C.
600	Robin Adair ..	4 years	A. Robinson ..	Murchison Show	30.10.07	W.R.
6/2	Robin Hood ..	2 years	Jas. Hamilton ..	Terang	19.8.08	J.L.
880	Rory's Pride ..	3 years	D. McCulloch ..	Melbourne ..	29.7.08	W.R.
401	Roseberry ..	Aged	Smith Bros. ..	Mansfield ..	30.8.07	W.J.C.
1242	Rowen Prince ..	6 years	J. Jenkin ..	Warrnambool ..	10.9.08	W.R.
17/2	Royal Albert ..	2 years	J. Haberfield ..	Warrnambool ..	10.9.08	W.R.
828	Royal Albert ..	3 years	W. Manifold ..	Melbourne ..	27.7.08	W.R.
1077	Royal Argyle ..	4 years	E. Williamson ..	Bendigo ..	19.8.08	W.J.C.
80	Royal Ben ..	6 years	F. Le Lievre ..	Swan Hill ..	7.8.07	W.R.
990	Royal Blend ..	3 years	Dick Bros. ..	Tatura	6.8.08	S.S.C.
711	Royal Blend ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
827	Royal Blue ..	Aged	Ed. McKay ..	Melbourne ..	27.7.08	W.J.C.
1051	Royal Blue ..	3 years	Thos. King ..	Warrnambool ..	14.8.08	W.R.
335	Royal Blue ..	3 years	H. Rathjen ..	Elmore	26.8.07	W.J.C.
440	Royal Cedric ..	6 years	Jno. Gooden ..	Warrnambool ..	10.9.07	W.J.C.
1052	Royal Charlie ..	3 years	W. Craig ..	Warrnambool ..	14.8.08	W.R
675	Royal Charlie ..	Aged	Thos. Potts ..	Kyneton Show ..	26.11.07	W R.
559	Royal Chief ..	3 years	T. Lowes ..	Wycheproof Show	4.10.07	W.R
1216	Royal Clyde ..	3 years	A. Oliver ..	Casterton ..	26.8.08	W.J.C.
783	Royal Colours ..	3 years	J. Ball	Melbourne ..	27.7.08	S.S.C.
1195	Royal Crown ..	4 years	W. Seaton ..	Royal Show ..	28.8.08	W.R.
1038	Royal Crown ..	3 years	A. Schulze ..	Rainbow ..	11.8.08	E.A.K.
1156	Royal Duke ..	3 years	P. E. Piper ..	Geelong ..	20.8.08	W.J.C.
1243	Royal Gartley ..	3 years	J. Gooden ..	Warrnambool ..	10.9.08	W.R.
1328	Royal Hero ..	4 years	Major Clarke ..	Kyneton .	24.9.08	W.J.C.
266	Royalist III. ..	Aged	H. Graham ..	Shepparton ..	24.8.07	S.S.C.
361	Royal Kingston ..	5 years	C. Northby ..	St. Arnaud ..	28.8.07	W.J.C.
1181	Royal Lad ..	3 years	C. Mason ..	Ararat	7.9.08	W.J.C.
1365	Royal Master ..	6 years	E. J. Brown ..	Corryong .	3.10.08	E.A.K.
2	Royal Prince ..	3 years	E. Wilson ..	Korumburra ..	29.9.06	S.S.C.
736	Royal Review ..	3 years	J. and W. Freeman	Melbourne ..	14.7.08	S.S.C.
334	Royal Ribbon ..	Aged	H. Boyd ..	Elmore	26.8.07	W.J.C.
1157	Royal Shepherd ..	5 years	T. Larcombe ..	Geelong ..	20.8.08	W.J.C.
883	Royal Stewart ..	3 years	W. Abram ..	Melbourne ..	30.7.08	J.L.
1330	Royal Stranger ..	3 years	T. McCaree ..	Kyneton ..	24.9.08	W J.C.
955	Royal Times ..	4 years	P. McDonald ..	Nathalia	4.8.08	S.S C.
829	Royalty	3 years	Harrison and Hastie	Melbourne ..	27.7.08	W.J.C.
1398	Roy McGregor ..	3 years	S. J. Lynn	Orbost	28.10.08	E.A.K.
657	Sampson	3 years	G. and W. Lord ..	Sale Show .	31.10.07	W.J C.
661	Sandow	Aged	G. McC. Lyon ..	Coleraine Show .	6.11.07	W J C.
830	Sandy's Heir ..	6 years	— McDonald ..	Melbourne ..	27.7.08	W.J C.
423	Scotch Thistle ..	3 years	Peter McIntyre ..	Geelong ..	31.8.07	S.S.C.
183	Scotland Again ..	Aged	F. Hamill ..	Maffra	16.8.07	W.J.C.
717	Scotland's Choice ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
629	Scotland's Fashion	5 years	Jno. James ..	Colac Show .	24.10.07	S.S.C.
693	Scotland Yet ..	3 years	J. Meehan ..	Bunyip Show ..	26.2.08	W.R.
1032	Scottish Chief ..	4 years	W. J. Molyneaux	Beulah	13.8.08	W.R.
982	Scottish Lad ..	5 years	A. C. Vincent ..	Wangaratta ..	5.8.08	W.J.C.
1370	Scottish Pride ..	3 years	J. J. Alexander ..	Shepparton .	6.10.08	W.R.
1002	Scottish Style ..	4 years	J. McDougall ..	Dookie	8.8.08	E.A.K.
1118	Searchlight ..	4 years	T. Munday ..	Bairnsdale ..	19.8.08	W.R.
1229	Selection	3 years	A. Watson ..	Mirboo North .	8.9.08	W.R.
1022	Shepherd Lad ..	4 years	M. Giles ..	Hopetoun ..	13.8.08	W.R.
1060	Shepherd Plaid ..	3 years	Otto Maroske ..	Nhill	14.8.08	J.L.
831	Shepherd Prince ..	Aged	J. C. Rockliff ..	Melbourne ..	27.7.08	J.L.
1016	Shepherd's Nugget	3 years	W. G. Down ..	Benalla ..	3.8.08	W.J.C.
649	Shepherd's Pride ..	3 years	William Day ..	Murchison Show	30.10.07	W.R.
1371	Shepparton Lad ..	5 years	A. C. Mason ..	Shepparton ..	6.10.08	J.L.
682	Silver Crest ..	3 years	P. Watson ..	Korumburra Show	22.1.08	W.R.
902	Silver Cup ..	3 years	J. McLeod ..	Melbourne ..	28.7.08	S.S.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—*continued.*			
726	Silver Cup ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
715	Silver King ..	3 years	Thos. Mason ..	Melbourne ..	14.7.08	S.S.C.
1338	*Simon*	*3 years*	*Innes Bros.* ..	*Warragul* ..	24.9.08	W.R.
196	Smuggler	6 years	S. Winter Cooke	Hamilton ..	17.8.07	W.R.
716	Solicitor General ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
833	Souter Johnny ..	3 years	Anderson Bros. ..	Melbourne ..	27.7.08	S.S.C.
762	*Specialty*	*3 years*	*Jno. Annison* ..	*Horsham* ..	16.7.08	S.S.C.
907	Springfield ..	4 years	Jas. Cullen ..	Melbourne ..	28.7.08	W.R.
1054	St. Albans ..	Aged	A. E. Schmidt ..	Warracknabeal ..	14.8.08	W.R.
223	St. Lawrence ..	Aged	F. Pilgrim and Sons	Nhill	21.8.07	S.S.C.
834	St. Lawrence ..	Aged	H. Middleton ..	Melbourne ..	27.7.08	W.R.
183	*Stanley*	*6 years*	*J. B. Trewin* ..	*Maffra*	16.8.07	W.J.C.
835	Star's Pride ..	3 years	W. T. Manifold ..	Melbourne ..	27.7.08	W.R.
778	Statesman ..	3 years	D. Lang ..	Charlton ..	23.7.08	W.J.C.
1004	Strathroy ..	5 years	W. G. Ballantyne	Dookie	8.8.08	E.A.K.
310	Strawn Brace ..	Aged	W. H. Lavery ..	Birchip	21.8.07	W.J.C.
643	*Stylish Style* ..	*3 years*	.. ..	*Pyramid Hill Show*	23.10.07	W.R.
321	Sir Albyn ..	4 years	R. Pinnock ..	Lilydale ..	23.8.07	W.J.C.
58	Sir Albyn ..	Aged	J. R. Johnston ..	Colac	7.8.07	S.S.C.
143	Sir Benjamin ..	Aged	J. Milstead ..	Sea Lake ..	15.8.07	N.McD.
1383	Sir Charles ..	3 years	Thos. Potts ..	Bendigo Show ..	14.10.08	E.A.K.
380	Sir Colin	4 years	Koch Bros. ..	Casterton ..	28.8.07	W.R.
360	Sir Colin	3 years	T. Gifford ..	St. Arnaud ..	28.8.07	W.J.C.
221	Sir David ..	6 years	Downigton Bros	Nhill	21.8.07	S.S.C.
264	Sir Donald ..	4 years	Thos. H. Roe ..	Shepparton ..	24.8.07	S.S.C.
517	Sir Herod II. ..	3 years	A. Watson ..	Kyneton ..	26.9.07	W.R.
209	*Sir James* ..	*Aged*	W. O'Callaghan ..	Minyip	21.8.07	W.R.
229	Sir Malcolm ..	6 years	W. R. Pittman ..	Nhill	21.8.07	S.S.C.
672	Sir Murdo ..	Aged	Thos. Wolfe ..	Yarram Show ..	20.11.07	W.J.C.
198	Sir Percy	4 years	T. McCrackens ..	*Hamilton* ..	17.8.07	W.R.
526	Sir Randler ..	3 years	R. W. Bowen ..	Kyneton ..	26.9.07	W.R.
832	Sir Richard ..	3 years	D. Hislop ..	Melbourne ..	27.7.08	W.J.C.
1329	Sir Rupert ..	Aged	Maxstead Bros.	Kyneton ..	24.9.08	W.J.C.
1349	Sir Thomas ..	6 years	Jno. Egan ..	Ballan	26.9.08	W.J.C.
20	Sir William ..	3 years	G. J. Kennedy ..	Horsham ..	18.7.08	S.S.C.
1305	Sir William ..	Aged	F. W. Scott ..	Smeaton ..	17.9.08	J.L.
641	Sir William ..	4 years	Jas. Langford ..	Pyramid Hill Show	23.10.07	W.R.
469	Sir William ..	4 years	G. Payne ..	Alexandra ..	14.9.07	W.J.C.
658	Sir William ..	6 years	Robt. Glen ..	Sale Show ..	31.10.07	W.J.C
836	Taieri's Pride ..	3 years	*Harrison and Hastie*	*Melbourne* ..	27.7.08	W.J.C.
790	Tam o' Shanter ..	Aged	J. Roberts ..	Charlton ..	23.7.08	W.J.C.
1094	Tasman	Aged	A. McMaster ..	Shepparton ..	22.8.08	W.J.C.
1291	The Admiral ..	5 years	F. S. Falkiner and Sons	Echuca	16.9.08	W.R.
718	The Benedict ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
664	The Colonel ..	4 years	G. and W. Lord	Traralgon Show ..	13.11.07	W.R.
730	The Conspirator ..	3 years	Mitchell and *O'Brien*	Melbourne ..	14.7.08	S.S.C.
7/2	The Count ..	2 years	Jas. Hamilton ..	Terang	19.8.08	J.L.
1339	The Don ..	Aged	G. Cathcart ..	Warragul ..	24.9.08	W.R.
1078	The Don	Aged	D. Anderson ..	Bendigo ..	19.8.08	W.J.C.
681	The Duke ..	5 years	B. McKenzie ..	Grantville and Jeetho Show	16.1.08	W.R.
1109	The General ..	3 years	A. J. Mackay ..	St. Arnaud ..	18.8.08	E.A.K.
421	The General ..	3 years	A. J. Spalding and Sons	Geelong ..	31.8.07	S.S.C.
562	The King	3 years	J. Biggar ..	Numurkah Show	9.10.07	W.J.C.
506	The Maori Prince ..	*Aged*	*Jas. Carson* ..	*Camperdown* ..	26.9.07	W.J.C.
912	The Marquis ..	Aged	A. H. Stansfield ..	Melbourne ..	28.7.08	W.J.C.
259	The McGregor ..	Aged	Dunning and Shea	Cobram ..	23.8.07	N.McD
1218	The Missing Link ..	3 years	E. H. Nolte ..	Casterton ..	26.8.08	W.J.C.
483	The Real Scottie ..	3 years	J. Biggar ..	Korumburra ..	29.9.06	S.S.C.
491	The Sirdar ..	..	E. A. *House* ..	*Daylesford* ..	20.9.07	W.J.C.
1293	Tip Top	3 years	D. McNamara ..	Elmore ..	17.9.08	W.R.
837	Tip Top	5 years	Le Marshall Bros.	Melbourne ..	27.7.08	W.R.
224	Togo	5 years	Jno. Dufty and Son	Nhill	21.8.07	S.S.C.
311	Togo	6 years	J. Cresp ..	*Birchip*	21.8.07	W.J.C
121	Togo	3 years	W. Curtis ..	Wangaratta ..	15.8.07	S.S.C
536	Tommy Burns ..	3 years	E. Sleep ..	Horsham Show ..	24.9.07	S.S.C
309	Tom's Pride ..	4 years	H. Green ..	Birchip	21.8.07	W.J.C

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			DRAUGHTS—*continued.*			
1277	*True Blue*	Aged	J. J. Frawley	Cranbourne	11.9.08	J.L.
1414	Tulchan Tarquin	..	S. Wrathall	Geelong	31.8.07	S.S.C.
1147	Tulchan Warwick	4 years	S. Wrathall	Geelong	21.8.08	J.L.
50	Tulchan Warrior	4 years	S. Wrathall	Hopetoun	3.8.07	W.J.C.
913	Tweed Lad	3 years	J. E. and M. Walters	Melbourne	28.7.08	S.S.C.
55	Tweedside Chief	5 years	Thos. Daffy	Colac	7.8.07	S.S.C.
451	Tweedside Hero	Aged	H. W. Adams	Warrnambool	10.9.07	W.J.C.
286	United Prince	6 years	P. Fitzpatrick	Kilmore	27.8.07	S.S.C.
703	Vanquisher	5 years	Jas. Mitchell	Agricultural Offices	22.5.08	S.S.C.
1221	Victorian Prince	3 years	Jno. Dickeson	Hamilton	25.8.08	W.J.C.
673	Volunteer	3 years	P. J. Keane	Yarram Show	20.11.07	W.J.C.
416	Waiponomu	3 years	E. Hooper	Geelong	31.8.07	S.S.C.
88	Waitaki Chief	5 years	W. Mosedale	Melton	10.8.07	S.S.C.
27/2	Wallace	2 years	*R. T. Mitchell*	Casterton	26.8.08	W.J.C.
768	Wallace Strong	3 years	Peter Plozza	Horsham	16.7.08	S.S.C.
1008	Warkworth Chieftain	5 years	W. Langley	Murtoa	11.8.08	W.R.
838	*Wee McGregor*	*3 years*	*W. T. Manifold*	*Melbourne*	*27.7.08*	W.R.
739	Welcome Jack	5 years	J. and W. Freeman	Melbourne	14.7.08	S.S.C.
700	Werribee Prince	4 years	— McKoy	Tallangatta Show	5.3.08	W.J.C.
454	Western Hero	..	Davis and Woolsthorpe	Warrnambool	10.9.07	W.J.C.
1348	Whanga-nui-a-tara	5 years	G. Hopwood and Son	Ballan	26.9.08	W.J.C.
1174	Wimmera	Aged	A. Price	Royal Show	26.8.08	J.L.
296	Wolseley	4 years	J. A. Rankin	Kaniva	28.8.07	N.McD.
244	Worrack	6 years	McLeod Bros.	Yarram	21.8.07	N.McD.
1006	Wyore	4 years	P. J. Reid	Wangaratta	5.8.08	J.L.
1068	Yarra Chief	3 years	S. Maxfield	Colac	18.8.08	J.L.
1080	Young Acorn	3 years	W. Gourley, sen.	Bendigo	19.8.08	W.J.C.
1310	Young Avondale	4 years	Benson Bros.	Melton	18.9.08	J.L.
765	Young Ben	4 years	T. F. Cornell	Horsham	16.7.08	S.S.C.
254	Young Champion	Aged	R. Blomeley	Cobram	23.8.07	N.McD.
1258	Young Champion	4 years	H. and R. Galloway	Maryborough	11.9.08	W.J.C.
1283	Young Champion Hero	5 years	G. H. Grindal	Frankston	14.9.08	J.L.
507	Young Clansman II.	6 years	A. Kelly	Camperdown	26.9.07	W.J.C.
392	Young Clifton	Aged	T. McKimmie	Seymour	29.8.07	W.J.C.
1366	*Young Coronation*	*4 years*	*E. A. Rangott*	*Swan Hill Show*	*30.9.08*	J.L.
1311	Young Down with the Dust	Aged	W. Moulsdale	Melton	18.9.08	J.L.
1119	Young Flashlight	4 years	*W. R. Chapman*	Bairnsdale	19.8.08	W.R.
3/2	Young Goldfinder	2 years	J. Shields	Dookie	8.8.08	E.A.K.
1133	Young Grampian	5 years	E. Cuthbert	Camperdown	19.8.08	J.L.
578	Young Heart of Oak	Aged	F. Rodda	Jeparit Show	16.10.07	W.J.C.
1175	Young Hercules	Aged	Ed. Storer	Condah	26.8.08	J.L.
1081	Young Herdsman	3 years	J. McGuigan	Bendigo	19.8.08	W.J.C.
766	Young Ian	3 years	Robt. Liddle	Horsham	16.7.08	S.S.C.
1177	Young Kilboughie	5 years	R. Roscoe	Condah	26.8.08	J.L.
878	Young Knight	Aged	H. De Little	Melbourne	29.7.08	W.J.C.
686	Young Loch Gyle	4 years	J. Henderson	Leongatha	11.2.08	S.S.C.
582	Young Lord Byron	3 years	A. McCallum	Jeparit Show	16.10.07	W.J.C.
1139	Young Lord Dundonald	3 years	P. Sullivan	Donald	19.8.08	E.A.K.
1023	Young Lyon	Aged	Anderson Bros.	Hopetoun	13.8.08	W.R.
208	Young Mariner	5 years	G. Stokes	Minyip	21.8.07	W.R.
675	Young McGregor	3 years	E. Don	Kyneton Show	26.11.07	W.R.
424	Young Model	3 years	M. McClelland	Geelong	31.8.07	S.S.C.
1230	Young Monarch	6 years	R. H. Darragh	Mirboo North	8.9.08	W.R.
227	Young Native Oak	4 years	— Irwin	Nhill	21.8.07	S.S.C.
1041	*Young Oak*	*Aged*	*S. McHarg*	*Rainbow*	*11.8.08*	E.A.K.
363	Young Officer	3 years	Jno. Gray	St. Arnaud	28.8.07	W.J.C.
20/2	Young Peer	2 years	Jas. McKimmie	Whittlesea	15.9.08	J.L.
1140	*Young Pride of Clyde*	*3 years*	*W. Dixon*	*Donald*	*19.8.08*	E.A.K.
655	Young Prince	Aged	Geo. Dennis	Maldon Show	30.10.07	S.S.C.
1244	Young Ranfurly	3 years	J. Whiting	Warrnambool	10.9.08	W.R.
1372	Young Royal	Aged	R. H. Liddle	Portland	7.10.08	W.J.C.
234	Young Royal Oak	Aged	W. Pohlner	Nhill	21.8.07	S.S.C.
1320	Young Russell	Aged	Mrs. E. Edwards	Kilmore	22.9.08	J.L.
12	Young Sir William	4 years	— Cain	Mirboo	25.10.06	S.S.C.
163	Young Sovereign	3 years	Webster Bros.	Benalla	17.8.07	S.S.C.
554	Young Stanley	6 years	R. Fleming	Wycheproof Show	4.10.07	W.R.
228	Young Straun	Aged	.. ..	Nhill	21.8.07	S.S.C.
382	Young Style	Aged	A. Oliver	Casterton	28.8.07	W.R.
1228	Young Treasure	6 years	T. Boyle	Sale	7.9.08	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

THOROUGHBREDS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
1219	Abaris	Aged	W. Robertson	Hamilton	25.8.08	W.J.C.
1341	Active	4 years	G. G. Aucherlonie	Morwell	28.9.08	W.R.
318	Alarm	Aged	Connelly Bros.	Birchip	21.8.07	W.J.C.
548	Alva	Aged	D. Coutts	Hamilton Show	19.9.07	N.McD.
842	Askelon	4 years	J. Widdis	Melbourne	28.7.08	S.S.C.
260	Attendant	6 years	T. Hanrahan	Cobram	23.8.07	N.McD.
1415	Barr	Aged	A. G. Bowman	Tallangatta Show	11.3.09	J.L.
395	Baunmoor	3 years	D. Ryan	Seymour	29.8.07	W.J.C.
843	Beechwood	4 years	Jas. Russell	Melbourne	28.7.08	S.S.C.
687	Ben Jonson	6 years	Percy Rowan	Leongatha Show	11.2.08	S.S.C.
449	Beware	Aged	J. Jenkins	Warrnambool	10.9.07	W.J.C.
271	Black Stone	Aged	R. Storey	Shepparton	24.8.07	S.S.C.
126	Bloodshot	Aged	T. Hart	Wangaratta	15.8.07	S.S.C.
1284	Brakpan	Aged	Briese Bros.	Wangaratta Show	15.9.08	E.A.K.
586	Carlyle	3 years	E. H. House	Maryborough Show	16.10.07	S.S.C.
272	Chesterman	Aged	T. O'Keefe	Shepparton	24.8.07	S.S.C.
289	Crest of the Wave	5 years	T. Harkness	Kilmore	27.8.07	S.S.C.
1285	Cuneiform	6 years	Briese Bros.	Wangaratta Show	15.9.08	E.A.K.
13/2	Eighteen Carat	2 years	C. Quinn	Royal Show	3.9.08	W.R.
645	Eumarrah	Aged	C. Nunn	Pyramid Hill Show	23.10.07	W.R.
131	Euphorion	Aged	P. Travers	Wangaratta	15.8.07	S.S.C.
463	Falkirk	Aged	D. Jackman	Warrnambool	10.9.07	W.J.C.
626	Freelance	4 years	R. Gilder	Maffra Show	24.10.07	W.J.C.
270	Gambler II.	Aged	Anderson and Sons	Shepparton	24.8.07	S.S.C.
127	Gnarpurt	Aged	H. P. Hoysted	Wangaratta	15.8.07	S.S.C.
1113	Godwin	Aged	D. Slattery	Bairnsdale	19.8.08	W.R.
934	Gosport	Aged	S. R. Bloomfield	Kerang	24.7.08	W.R.
1241	Graftondelle	Aged	J. Jenkins	Warrnambool	10.9.08	W.R.
551	Grand Emerald	6 years	J. McKenna	Wycheproof	4.10.07	W.R.
406	Guide	Aged	C. McLean	Mansfield	30.8.07	W.J.C.
249	Hainault	Aged	G. Collis	Yarram	21.8.07	N.McD.
627	Heather Lad	Aged	C. R. Davis	Maffra Show	24.10.07	W.J.C.
1381	High Time	3 years	D. O'Halloran	Bendigo Show	14.10.8	E.A.K.
83	Hobson	Aged	C. Edwards	Swan Hill	7.8.07	W.R.
1152	Invergordon	Aged	J. Mitchell	Geelong	28.8.08	W.J.C.
1394	Lord Grafton	4 years	T. T. Mulder	Colac Show	29.10.08	W.R.
1187	Lake King	3 years	W. P. Brennan	Sale	7.9.08	W.R.
1405	Le Var	Aged	S. P. Mackay	Berwick	10.11.08	W.R.
1020	Little Sailor	Aged	H. Jenkins	Hopetoun	13.8.08	W.R.
754	Loch Farran	Aged	W. Reece	Horsham	16.7.08	S.S.C.
972	Lonely Miller	3 years	J. Meusch	Cobram	5.8.08	E.A.K.
1326	Magister	3 years	J. McCrae	Kyneton	24.9.08	W.J.C.
237	Merriang	Aged	D. S. Anderson	Nhill	21.8.07	S.S.C.
1074	McClaris	4 years	T. Bailey	Bendigo	19.8.08	W.J.C.
336	Pascarel	Aged	A. Fairbanks	Elmore	26.8.07	W.J.C.
699	Pilgrim's Rest	Aged	A. E. Scholz	Tallangatta Show	5.3.08	W.J.C.
1408	Portsea	Aged	E. Manifold	Camperdown	26.11.08	E.A.K.
114	Presto	Aged	G. Washington	Euroa	14.8.07	S.S.C.
569	Preston	Aged	C. Pratt	Seymour Show	11.10.07	W.J.C.
974	Rataplan	Aged	George Smith	Cobram	5.8.08	E.A.K.
760	Richman	4 years	J. Cadden	Murchison	6.8.08	S.S.C.
1322	Right Royal	5 years	J. McKinnon	Korumburra	23.9.08	E.A.K.
1227	Rufus	3 years	R. Gilder	Sale	7.9.08	W.R.
938	Schimmell	Aged	E. Wren	Kerang	24.7.08	W.R.
1220	Scot Free	Aged	S. Winter Cooke	Hamilton	25.8.08	W.J.C.
1160	Snap Shot	5 years	E. A. House	Daylesford	21.8.08	E.A.K.
908	Steel King	4 years	John Widdis	Melbourne	28.7.08	W.R.
464	Straightfire	Aged	A. E. Saunders	Alexandra	14.9.07	W.J.C.
537	Straightshot	Aged	John McDonald	Horsham Show	24.9.07	S.S.C.
1342	Symphony	Aged	G. G. Auchterlonie	Morwell	28.9.08	W.R.
1416	The Captain	Aged	J. C. Hodson	Tallangatta Show	11.3.09	J.L.
625	The Chevalier	Aged	R. Gilder	Maffra Show	24.10.07	W.J.C
194	The Harvester	Aged	S. Winter Cooke	Hamilton	17.8.07	W.R.
911	The Labourer	6 years	A. E. Dunn	Melbourne	28.7.08	J.L.
29	Trentbridge	Aged	J. Develin	Horsham	18.7.07	S.S.C.
236	Vengeance	Aged	R. Ward	Nhill	21.8.07	S.S.C
1250	Voyou	Aged	R. Gaitskell	Bacchus Marsh	10.9.08	W.J.C
485	Westerley	Aged	F. R. G. Robertson	Korumburra	29.9.06	S.S.C
498	Winchester	Aged	Chas. Airey	Rupanyup	20.9.07	W.R.
612	Wotan	4 years	T. Dickenson	Ballarat Show	17.10.07	S.S.C
15/2	Yeast	2 years	C. Quinn	Royal Show	3.9.08	W.R.

List of Certificated Stallions—*continued.*

LIGHT HORSES.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
943	Abbey Bells	Aged	G. and A. Tye	Mentone	1.8.08	S.S.C.
708	Alarm	4 years	Mitchell and O'Brien	Melbourne	14.7.08	S.S.C.
477	Alarm Gun	6 years	John Boulger	Morwell	16.9.07	W.J.C.
280	Alma C.	3 years	J. A. K. Clark	Shepparton	24.8.07	S.S.C.
598	Almont	Aged	A. and J. B. Sharp	Agricultural Offices	31.10.07	W.R.
589	Almont Ambassador	5 years	J. Cameron	Maryborough Show	16.10.07	S.S.C.
187	Almont B.	6 years	F. W. Schickerling	Warracknabeal	14.8.07	W.R.
1315	Almont Rose	3 years	E. Martin	Inglewood	18.9.08	W.R.
994	Almont Sharp	4 years	W. Hutchinson	Murchison	6.8.08	S.S.C.
1282	Alonzo	Aged	R. V. Collier	Lang Lang	11.9.08	E.A.K.
1127	Alto Dick	3 years	W. N. Hindhaugh	Camperdown	19.8.08	J.L.
119	Ashplant II.	Aged	A. Kennedy	Euroa	14.8.07	S.S.C.
5	Aster	Aged	R. F. Kurrle	Korumburra	29.9.06	S.S.C.
930	Audacious	Aged	J. R. Maxwell	Kerang	24.7.08	W.R.
90	Austerlitz	Aged	W. Uebergang	Murtoa	9.8.07	W.J.C.
377	Avon Peer	Aged	— Boyle	St. Arnaud	28.8.07	W.J.C.
793	Banker	6 years	Speers Bros.	Melbourne	27.7.08	W.R.
1355	Baron	Aged	Garvin and Gray	Boort Show	30.9.08	E.A.K.
545	Barrister	Aged	Bell Bros.	Murtoa Show	27.9.07	S.S.C.
1386	Bay Bells	3 years	W. Lamb	Geelong Show	21.10.08	W.J.C.
427	Bay Hawk	Aged	E. Hooper	Geelong	31. 8.07	S.S.C.
276	Bell Boy	6 years	Griffin Bros.	Shepparton	24.8.07	S.S.C.
13/2	Belmont	2 years	J. Pakes	Royal Show	28.8.08	E.A.K.
844	Belvoir	Aged	J. Carmichael	Melbourne	28.7.08	S.S.C.
977	Bengal	Aged	M. and T. Duncan	Wangaratta	5.8.08	W.J.C.
1102	Bentwood	Aged	B. Hayes	St. Arnaud	18.8.08	E.A.K.
458	Best of Quality	Aged	G. Smith	Warrnambool	10.9.07	W.J.C.
1062	Billy	3 years	A. E. Haywood	Colac	17.8.08	W.J.C.
845	Bismarck	Aged	Alfred Neave	Melbourne	28.7.08	W.R.
461	Black Boy	Aged	J. G. Cox	Warrnambool	10.9.07	W.J.C.
631	Black Hawk	3 years	G. S. Farrar	Colac Show	24.10.07	S.S.C.
577	Blackness	Aged	R. Penny	Jeparit Show	16.10.07	W.J.C.
482	Black Prince	4 years	T. Mackie	Morwell	16.9.07	W.J.C.
970	Black Turpin	Aged	Jno. Mitchell	Cobram	5.8.08	E.A.K.
684	Black Wilkes	Aged	W. J. Wilson	Korumburra Show	22.1.08	W.R.
846	Black Wind	Aged	S. Young	Melbourne	28.7.08	W.J.C.
847	Blue Peter II.	5 years	Alfred Neave	Melbourne	28.7.08	W.R.
1178	Boatman	Aged	Mrs. Wilson	Ararat	7.9.08	W.J.C.
147	Bold Harold	Aged	W. Purcher	Sea Lake	15.8.07	N.McD.
1096	Bolinda	Aged	Jos. Tilley	Port Fairy	18.8.08	J.L.
86	Bonnie Lea	Aged	S. Taylor	Swan Hill	7.8.07	W.R.
1321	Bonza	Aged	G. Whiteman	Kilmore	22.9.08	J.L.
745	Boomerang	4 years	A. Hutcheson	Horsham	16.7.08	S.S.C.
744	Bo Peep	6 years	J. C. R. Jende	Horsham	16.7.08	S.S.C.
1316	Boswell	Aged	P. Lyons	Inglewood	18.9.08	W.R.
579	Brightlight	Aged	R. Penny	Jeparit Show	16.10.07	W.J.C.
30	Broncho	3 years	W. F. Allen	Horsham	18.7.07	S.S.C.
169	Brooklyn Junr.	3 years	E. W. Roscoe	Benalla	17.8.07	S.S.C.
279	Brooklyn Peer	3 years	W. Mahoney	Shepparton	24.8.07	S.S.C.
405	Brown Harold	6 years	C. McLean	Mansfield	30.8.07	W.J.C.
795	Bundoora	3 years	Donald McKey	Melbourne	27.7.08	W.R.
959	Bungarby	4 years	E. Brensing	Nathalia	3.8.08	S.S.C.
556	Cabena	3 years	M. Kinnana	Wycheproof Show	4.10.07	W.R.
164	Calliope	Aged	S. Gardiner	Benalla	17.8.07	S.S.C.
849	Captain Tracy	Aged	A. McLennan	Melbourne	28.7.08	W.R.
440	Cheviot	6 years	M. Zimmer	Agricultural Offices	11.9.07	W.J.C.
24/2	Chief Huon	2 years	A. C. Scott	Numurkah	23.10.08	E.A.K.
1090	Chief Justice	4 years	A. J. Dunkley	Shepparton	22.8.08	W.J.C.
1380	Childe Osterley	4 years	John Mitchell	Bendigo	14.10.08	E.A.K.
1028	Chiming Bells	3 years	A. J. Whitehill	Agricultural Offices	15.8.08	W.J.C.
1091	Claredo	Aged	J. Swindle	Shepparton	22.8.08	W.J.C.
1071	Claretonian	5 years	H. C. Plainbeck	Bendigo	19.8.08	W.J.C.
1188	Cleve Don	4 years	T. Larcombe	Royal Show	28.8.08	J.L.
472	Colleague	4 years	H. Coller	Alexandra	14.9.07	W.J.C.
428	Commodore	Aged	G. Kemp	Geelong	31.8.07	S.S.C.
1367	Commonwealth Prince	Aged	— McCann	Swan Hill Show	30.9.08	J.L.
1343	Consequence	Aged	Hill Bros.	Horsham	25.9.08	S.S.C.
653	Contractor	4 years	J. Ovens	Murchison	30.10.07	W.R.
105	Coolgardie	Aged	Alex. Gunn	Donald	14.8.07	W.J.C.
616	Cosmopolitan Jnr.	6 years	A. Wade	Ballarat Show	17.10.07	S.S.C.
1076	Courtly	6 years	C. Marchesi	Bendigo	19.8.08	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner	Parade.	Date.	Officer.
	LIGHT HORSES—*continued.*					
603	Crown Derby	3 years	Woolcock Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
1135	Dan Alto	3 years	R. G. Hannah ..	Donald	19.8.08	E.A.K.
104	Dan Cleve ..	5 years	— McCubbin ..	Donald	14.8.07	W.J.C.
944	Dan Patch ..	6 years	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
323	Dan Tracey ..	5 years	J. G. Christie ..	Lilydale ..	23.8.07	W.J.C.
529	Defoe	Aged	J. Brooks ..	Kyneton ..	26.9.07	W.R.
1261	Deisha	Aged	J. J. Challis ..	Ballarat ..	11.9.08	W.J.C.
455	Demonstrator ..	4 years	Jas. Gooden ..	Warrnambool ..	10.9.07	W.J.C.
1213	Desert King ..	Aged	A. Shanks ..	Casterton ..	26.8.08	W.J.C.
81	Dexter	Aged	T. Wilkins ..	Swan Hill ..	8.7.07	W.R.
932	Digitalis	Aged	E. Wren ..	Kerang ..	24.7.08	W.R.
648	Digitalis II. ..	5 years	S. Winterbottom	Pyramid Hill Show	23.10.07	W.R.
881	Dignity	6 years	J. J. Downes ..	Melbourne ..	30.7.08	W.R.
101	Diogenes	Aged	W. E. Trollope ..	Donald	14.8.07	W.J.C.
925	Director	3 years	D. Foley ..	Boort	21.7.08	W.R.
704	Director	6 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
1075	Director Pell Mell ..	3 years	G. R. Greaves ..	Bendigo ..	19.8.08	W.J.C.
354	Dirk Hammerhand	5 years	J. M. Campbell ..	Echuca ..	24.8.07	W.J.C.
355	Dirk Hammerhead	4 years	— Bowtell ..	Echuca ..	24.8.07	W.J.C.
971	Dixie	3 years	J. Donkin ..	Cobram ..	5.8.08	E.A.K.
679	Dixie Alto ..	Aged	W. B. Viers ..	Kyneton Show ..	26.11.07	W.R.
1122	Dixie G.	5 years	W. Erving ..	Terang	19.8.08	J.L.
841	Dixie Tracy ..	3 years	A. Cockroft ..	Melbourne ..	27.7.08	W.R.
1129	Donald	3 years	Thos. Williams ..	Camperdown ..	19.8.08	J.L.
410	Donald Mac ..	Aged	A. Stewart ..	Mansfield ..	30.8.07	W.J.C.
952	Don Bell	Aged	O. Baldwin ..	Nathalia ..	3.8.08	S.S.C.
891	Don Carlo	Aged	E. P. Hood ..	Heathcote ..	3.8.08	W.R.
1092	Don Cleve	Aged	John Swindle ..	Shepparton ..	22.8.08	W.J.C.
383	Dragon	Aged	D. Munro ..	Casterton ..	28.8.07	W.R.
38	Druce	3 years	D. Canny ..	Traralgon ..	31.7.07	S.S.C.
247	Dynamo	5 years	A. Stoner ..	Yarram ..	21.8.07	N.McD.
129	Earl Hampden	3 years	J. E. Kneebone ..	Wangaratta ..	15.8.07	S.S.C.
1205	Earl Huon ..	4 years	O. Dutton ..	Royal Show ..	28.8.08	J.L.
118	Eclipse	Aged	A. Kennedy ..	Euroa	14.8.07	S.S.C.
678	Eclipse	5 years	Jas. Tranter ..	Kyneton Show ..	26.11.07	W.R.
1368	Edward	4 years	Simon Frazer ..	Swan Hill Show ..	30.9.08	J.L.
523	Emerald	5 years	J. Danaher ..	Kyneton ..	26.9.07	W.R.
10/2	Emulation ..	2 years	A. McFarlane ..	Geelong ..	20.8.08	W.J.C.
1201	Emulator ..	Aged	J. B. Zander ..	Royal Show ..	28.8.08	E.A.K.
1189	Emulator, junr.	4 years	R. G. Keys ..	Royal Show ..	28.8.08	E.A.K.
120	Emulous	5 years	M. Cann ..	Euroa	14.8.07	S.S.C.
856	Era	4 years	W. Rogers ..	Melbourne ..	28.7.08	W.R.
1064	Errand Boy ..	3 years	R. Elliott ..	Colac	18.8.08	W.J.C.
1254	Erroneous ..	Aged	A. G. Stewart ..	Maryborough ..	11.9.98	W.J.C.
407	Euri	Aged	J. R. Arbuthnott	Mansfield ..	30.8.07	W.J.C.
549	Experience ..	..	Glenister Bros. ..	Hamilton Show ..	19.9.07	N.McD.
748	Experiment ..	3 years	R. Mackay ..	Horsham ..	16.7.08	S.S.C.
1376	Explorer	Aged	A. M. Grautt ..	Mildura Show ..	14.10.08	J.L.
749	Exponent ..	3 years	A. McLennan ..	Horsham ..	16.7.08	S.S.C.
201	F.D.B.	3 years	M. Vaughan ..	Hamilton ..	17.8.07	W.R.
613	Fearless	3 years	T. Dickenson ..	Ballarat ..	17.10.07	S.S.C.
551	Fintonia	Aged	J. White ..	Minyip Show ..	1.10.07	N.McD.
576	Fire Away ..	Aged	W. Habick ..	Jeparit Show ..	16.10.07	W.J.C.
1036	Fireworks ..	Aged	P. Gildea ..	Rainbow ..	11.8.08	E.A.K.
945	First Ribbon ..	4 years	G. and H. Tye ..	Mentone ..	1.8.08	S.S.C.
376	Fitz James ..	5 years	Dyke Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
1272	Flying Star ..	5 years	J. McFarlane ..	Dandenong ..	10.9.08	E.A.K.
72	Fontenoy ..	Aged	J. Hoolahan ..	Dookie	27.7.07	W.J.C.
352	Frank Harold ..	6 years	D. McLeod ..	Echuca	24.8.07	W.J.C.
170	Frank Osterley ..	4 years	G. Ward ..	Benalla ..	21.8.07	S.S.C.
1397	Fry Pan	3 years	Geo. Nixon ..	Orbost	28.10.08	E.A.K.
921	Galtee Boy ..	5 years	W. Hedigan ..	Birchip ..	21.7.08	W.J.C.
525	Galty Boy ..	4 years	A. R. Laurence ..	Kyneton ..	26.9.07	W. R.
978	Gaylite	4 years	E. H. Gannell ..	Wangaratta ..	5.8.08	W.J.C.
857	General R. ..	4 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
614	General Standish ..	Aged	J. Davies ..	Ballarat Show ..	17.10.07	S.S.C.
958	General Tracey II. ..	4 years	S. Thompson ..	Numurkah ..	4.8.08	S.S.C.
966	General Tracy ..	Aged	Alex. Parsell ..	Tungamah ..	4.8.08	W.J.C.
1414	Glen Martin ..	6 years	H. Peterson ..	Tallangatta Show	11.3.09	J.L.
859	Golden Eagle ..	5 years	J. Small, N.Z. ..	Melbourne ..	28.7.08	S.S.C.
079	Golden King ..	4 years	M. Neary ..	Wangaratta ..	5.8.08	J.L.
273	Goldie	3 years	H. J. Scott ..	Shepparton ..	24.8.07	S.S.C.
571	Gold Top ..	Aged	M. Darcy ..	Seymour ..	11.10.07	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	LIGHT HORSES—*continued.*					
705	Goodwood ..	Aged	F. H. Walsh ..	Melbourne ..	14.7.08	S.S.C.
103	Governor	3 years	— McCubbery ..	Donald ..	14.8.07	W.J.C.
159	Governor Tracey ..	Aged	E. G. Gorman ..	Yarrawonga ..	16.8.07	S.S.C.
539	Graingeburn ..	3 years	A. Ballenger ..	Horsham Show ..	24.9.07	S.S.C.
606	Grainger Junr. II. ..	Aged	.. .. ..	Ballarat Show	17.10.07	S.S.C.
396	Grandeur ..	Aged	D. Ryan ..	Seymour ..	29.8.07	W.J.C.
953	Grand March II. ..	Aged	B. Ferrari, junr. ..	Nathalia ..	3.8.08	S.S.C.
28	Granger II. ..	5 years	W. F. Allen ..	Horsham ..	18.7.07	S.S.C.
60	Grey Hawk ..	Aged	W. W. Pierce ..	Colac	7.8.07	S.S.C.
213	Grey Royal ..	Aged	A. Boyd ..	Minyip	21.8.07	W.R.
662	G.T.F.	6 years	Glenister Bros. ..	Coleraine Show ..	6.11.07	W.J.C.
1255	Guitar	Aged	J. H. Bruhn ..	Maryborough ..	11.9.08	W.J.C.
356	Haco	Aged	Curragh Bros. ..	Echuca	24.8.07	W.J.C.
946	Hal Zolock ..	3 years	G. and H. Tye ..	Mentone ..	1.8.08	S.S.C.
670	Hambletonian Bell Boy	Aged	Gregg and Crowe	Northcote ..	16.11.07	S.S.C.
302	Hambletonian Boy	6 years	Peter Thompson	Wycheproof ..	20.8.07	W.J.C.
980	Hampden ..	Aged	J. H. McInnes ..	Wangaratta ..	5.8.08	J.L.
11/2	Happy Bells ..	2 years	F. Cox	Geelong ..	28.8.08	W.J.C.
809	Harmony ..	Aged	A. W. Fletcher ..	Melbourne ..	27.7.08	W.R.
876	Harold	4 years	Alex. Colvin ..	Melbourne ..	29.7.08	W.J.C.
877	Harold Douglas ..	5 years	Alex. Colvin ..	Melbourne ..	29.7.08	W.J.C.
100	Harold H. ..	5 years	R. C. Hannah ..	Donald	14.8.07	W.J.C.
211	Hassan	Aged	E. A. Watson ..	Minyip	21.8.07	W.R.
1344	Height of Fashion ..	Aged	T. and V. Brown	Horsham Show ..	25.9.08	S.S.C.
1049	Hero	..	J. McKenzie ..	Warracknabeal ..	14.8.08	W.R.
1357	Hero	Aged	John Boyle ..	Boort	30.9.08	E.A.K.
1124	*Hill Mont* ..	*3 years*	*W. Erving* ..	*Terang*	*19.8.08*	*J.L.*
275	Honest Bert ..	Aged	T. Harrison ..	Shepparton ..	24.8.07	S.S.C.
811	Honest Cleve ..	3 years	O. Baldwin ..	Melbourne ..	27.7.08	W.R.
1026	Honest Jack ..	..	J. Gallagher ..	Romsey ..	14.8.08	W.J.C.
115	Honest Lad ..	4 years	F. P. Boyle ..	Euroa	14.8.07	S.S.C.
862	Honest Lad ..	4 years	E. H. B. Young ..	Melbourne ..	28.7.08	W.R.
1010	Honest Lea ..	Aged	D. Ryan ..	Alexandra ..	11.8.08	W.J.C.
136	Hornsborough ..	3 years	J. McGuinness ..	Wangaratta ..	15.8.07	S.S.C.
188	Huon Seaton ..	6 years	Phillips and Devereaux	Warracknabeal ..	15.8.07	W.R.
1190	Ian Cleve	Aged	Miss Phipps ..	Royal Show ..	28.8.08	E.A.K.
456	*Imperial*	*Aged*	*H. W. Adams* ..	*Warrnambool* ..	*10.9.07*	*W.J.C.*
863	Imperial Willie ..	3 years	J. Small ..	Melbourne ..	28.7.08	S.S.C.
1273	Inform	4 years	G. Crook ..	Dandenong ..	10.9.08	E.A.K.
132	*Integrity*	*Aged*	*J. B. Docker* ..	*Wangaratta* ..	*15.8.07*	*S.S.C.*
426	Integrity	Aged	J. J. Eadey ..	Geelong ..	31.8.07	S.S.C.
1105	Integrity	Aged	W. Gleeson, junr.	St. Arnaud ..	18.8.08	E.A.K.
956	Irish King ..	Aged	J. H. Roberts ..	Kerang ..	24.7.08	W.R.
165	Iroquois	Aged	G. Pearson ..	Benalla ..	17.8.07	S.S.C.
135	Ito	Aged	J. Graham ..	Wangaratta ..	15.8.07	S.S.C.
865	Jack W.	Aged	R. Tutty ..	Melbourne ..	28.7.08	W.R.
866	Jay Belden ..	5 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
864	Jerill	5 years	D. Hislop ..	Melbourne ..	28.7.08	W.R.
77	Joker	Aged	.. .. ..	Dookie	27.7.07	W.J.C.
46	Jonathan	Aged	W. Hiscock ..	Pyramid Hill ..	3.8.07	S.S.C.
157	J. R. Wilkes ..	Aged	Tom Bros. ..	Yarrawonga ..	16.8.07	S.S.C.
1207	Judge Huon ..	Aged	O. Dutton ..	Royal Show ..	28.8.08	W.R.
538	Juniper	Aged	Langley Bros. ..	Horsham Show ..	24.9.07	S.S.C.
246	*Jupiter, Junr.* ..	*Aged*	*Rossiter Bros.* ..	*Yarram* ..	*21.8.07*	*N.McD.*
1180	Justice	6 years	Harricks Bros. ..	Ararat ..	7.9.08	W.J.C.
918	Kaaban	4 years	M. Kenane ..	Charlton ..	23.7.08	W.J.C.
342	Kentucky ..	6 years	H. C. Johnson ..	Elmore ..	26.8.07	W.J.C.
867	Khakee	Aged	T. Nolan ..	Melbourne ..	28.7.08	W.R.
773	Killarney	Aged	W. Reece ..	Goroke	21.7.08	S.S.C.
618	Killarney II. ..	Aged	Grace and Fletcher	Ballarat Show ..	17.10.07	S.S.C.
647	King Bronte ..	Aged	C. Hands ..	Pyramid Hill Show	23.10.07	W.R.
513	King Draper ..	..	Victor Edgar ..	Camperdown ..	26.9.07	W.J.C.
868	Kingfisher ..	Aged	J. S. Orr ..	Melbourne ..	28.7.08	S.S.C.
481	King Harold ..	Aged	Francis Bros. ..	Morwell ..	16.9.07	W.J.C.
102	*King Harold* ..	*5 years*	*T. McCubbery* ..	*Donald* ..	*14.8.07*	*W.J.C.*
937	King Midas ..	6 years	D. Maxwell ..	Kerang	24.7.08	W.R.
331	Kintyre	6 years	— McGregor ..	Elmore ..	26.8.07	W.J.C.
602	La Marnie ..	4 years	Gilbert Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
617	Larrakin	Aged	Mrs. Sutherland ..	Ballarat Show ..	17.10.07	S.S.C.
615	Lernecker ..	Aged	C. Lippiatt ..	Ballarat Show ..	17.10.07	S.S.C.
871	Lieutenant Osterley	5 years	A. J. Clark ..	Melbourne ..	28.7.08	S.S.C.
1073	Little Hambletonian	4 years	H. C. Plainbeck ..	Bendigo ..	19.8.08	W.J.C.
1224	Londonderry ..	3 years	J. Finney ..	Sale	7.9.08	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			LIGHT HORSES—*continued.*			
468	Lord Derby ..	Aged	T. Wilmot ..	Alexandra ..	14.9.07	W.J.C.
884	Lord Harold ..	3 years	A. Colvin ..	Melbourne ..	30.7.07	W.R.
755	Lord Hope ..	Aged	D. Bunworth ..	Horsham ..	16.7.08	S.S.C.
706	Lord of the Isles ..	4 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
1295	Lord Roberts ..	Aged	H. J. Payne ..	Lilydale ..	17.9.08	E.A.K.
873	Lord Vanderook ..	Aged	W. Abrams ..	Melbourne ..	28.7.08	W.J.C.
62	Londoun Squire ..	5 years	J. Dunlop ..	Colac	7.8.07	S.S.C.
465	Macquarie ..	Aged	T. Aldons ..	Alexandra ..	14.9.07	W.J.C.
960	Major Tracy ..	4 years	T. H. Ford ..	Numurkah ..	4.8.08	S.S.C.
892	Maori	4 years	A. McDonald ..	Melbourne ..	28.7.08	W.R.
630	Maori Chief ..	3 years	L. Strickland ..	Colac Show ..	24.10.07	S.S.C.
973	March	Aged	J. E. Turner ..	Cobram ..	5.8.08	E.A.K.
137	*Marland Derby* ..	*Aged*	*Stewart and Sloan*	*Wangaratta* ..	*15.8.07*	*S.S.C.*
947	Marvin Wilkes ..	Aged	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
528	Mazeppa	Aged	A. W. Harvey ..	Kyneton ..	26.9.07	W.R.
1388	Merry Spark ..	Aged	Crozier Bros. ..	Lilydale ..	17.9.08	E.A.K.
688	Message	6 years	W. H. Michael ..	Leongatha Show	11.2.08	S.S.C.
303	Metal B.	6 years	E. Glasheen ..	Wycheproof ..	20.8.07	W.J.C.
300	Millstone	Aged	J. O'Donohue ..	Elmore	26.8.07	W.J.C.
581	Miss Prize.. ..	6 years	J. T. McGarvith ..	Jeparit Show ..	16.10.07	W.J.C.
1382	Mistake	5 years	Robt. Southby ..	Bendigo Show ..	14.10.08	E.A.K.
278	More Huon ..	3 years	T. Moore ..	Shepparton ..	24.8.07	S.S.C.
8/2	Mormon	2 years	H. G. Stansmore	Camperdown ..	19.8.08	J.L.
1263	Nero	Aged	J. Jopling ..	Ballarat ..	11.9.08	W.J.C.
923	Never Sweat II.. ..	5 years	J. Gilmore ..	Sea Lake ..	22.7.08	W.J.C.
488	Nick o' the Woods ..	Aged	M. P. Marwick ..	Daylesford ..	20.9.07	W.J.C.
295	Norback	5 years	F. Quire ..	Kaniva ..	27.8.07	N.McD.
948	Obligado	4 years	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
1314	Odd Trick ..	Aged	Dolman Bros. ..	Coleraine ..	19.9.08	W.J.C.
2/2	*Ohio*	*2 years*	*Dr. McArdle* ..	*Wangaratta* ..	*7.8.08*	*W.J.C.*
919	Olympian ..	6 years	D. Long ..	Charlton ..	23.7.08	W.J.C.
189	Olympic	3 years	Thompson Bros. ..	Warracknabeal ..	14.8.07	W.R.
366	Olympic Yet ..	3 years	— Bryce ..	St. Arnaud ..	30.8.07	W.J.C.
1143	Orme	6 years	John Ball ..	Werribee ..	21.8.08	J.L.
1193	Orthodox	Aged	J. Brown ..	Royal Show ..	28.8.08	J.L.
634	Oscar	4 years	Wm. Anderson ..	Colac Show ..	24.10.07	S.S.C.
1363	Osman	6 years	A. H. Hamilton ..	Corryong ..	3.10.08	E.A.K.
1085	Osprey	3 years	H. G. Staff ..	Traralgon ..	17.8.08	W.R.
607	Osprey II. ..	5 years	Gilbert Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
1142	Osprey Premier ..	6 years	A. D. Rowan ..	Werribee ..	21.8.08	J.L.
646	Ostenesty ..	6 years	F. J. Dormain ..	Pyramid Hill Show	23.10.07	W.R.
896	Osterley Junior ..	5 years	P. S. Laird ..	Melbourne ..	28.7.08	W.J.C.
1292	Oster Boccacio ..	Aged	H. Cattlin ..	Elmore	17.9.08	W.R.
588	Osterfield	6 years	— Willatts ..	Maryborough Show	16.10.07	S.S.C.
652	Osterley II. ..	..	W. Hutchinson ..	Murchison Show ..	30.10.07	W.R.
923	*Osterley Again* ..	*3 years*	*Wm. Hihneberg* ..	*Birchip* ..	*21.7.08*	*W.J.C.*
460	Osterley Again ..	4 years	G. Smith ..	Warrnambool ..	10.9.07	W.J.C.
26	Osterley Hero ..	5 years	E. Koenig ..	Horsham ..	18.7.07	S.S.C.
544	Osterley Junior ..	Aged	Gladys Bros. ..	Murtoa Show ..	24.9.07	S.S.C.
235	Osterley Wilkes ..	Aged	J. B. Marshall ..	Nhill	21.8.07	S.S.C.
632	Osterlight ..	3 years	G. S. Connor ..	Colac Show ..	24.10.07	S.S.C.
633	Ostermeyer ..	5 years	E. Batson ..	Colac Show ..	24.10.07	S.S.C.
1336	Osterwind ..	Aged	F. McNab ..	Warragul ..	24.9.08	W.R.
434	Ostray	6 years	J. Fitzgerald ..	Geelong ..	31.8.07	S.S.C.
989	Ostrich II. ..	5 years	J. P. Ovens ..	Tatura	6.8.08	S.S.C.
290	Oswestry	5 years	J. Hefferman ..	Kilmore ..	27.8.07	S.S.C.
93	Othello	5 years	A. Shebler ..	Melton	10.8.07	S.S.C.
1225	Owhy	3 years	C. B. Trood ..	Sale	7.9.08	W.R.
1194	Owyhee	Aged	D. Taylor ..	Royal Show ..	28.8.08	W.R.
1153	Owyhee Junior ..	4 years	E. Batson ..	Geelong ..	20.9.08	J.L.
897	Oyama	6 years	A. H. Capron ..	Melbourne ..	28.7.08	S.S.C.
1317	O.Y.D.	4 years	P. Lyons ..	Inglewood ..	18.9.08	W.R.
1202	*O.Y.K.*	*3 years*	*E. H. Palfrey* ..	*Royal Show* ..	*28.8.08*	*E.A.K.*
1065	Paymaster ..	Aged	W. McCombe ..	Colac	17.8.08	W.J.C.
605	Pedestal	5 years	T. Davies ..	Ballarat Show ..	17.10.07	S.S.C.
130	Pianola	Aged	F. Larkin ..	Wangaratta ..	15.8.07	S.S.C.
149	*Planet Boy* ..	*Aged*	*C. Butcher* ..	*Sea Lake* ..	*15.8.07*	*N.McD.*
297	Premier	5 years	Jos. Binns ..	Kaniva ..	28.8.07	N.McD.
117	Priam	Aged	L. Cusack ..	Euroa	14.8.07	S.S.C.
926	Prince Bronte ..	Aged	G. Bottomley ..	Boort	21.7.08	W.R.
1155	Prince Charman ..	3 years	Geo. Golightly ..	Geelong ..	20.8.08	W.J.C.
340	Prince Osterley ..	5 years	D. Murphy ..	Elmore	26.8.07	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

LIGHT HORSES—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
546	Prince Osterley ..	4 years	C. W. Watts, jun.	Agricultural Offices	1.10.07	W.R.
351	Prince Whips ..	5 years	J. McLeod ..	Echuca	24.8.07	W.J.C.
532	Principal	Aged	Glenister Bros. ..	Horsham Show ..	24.9.07	S.S.C.
758	Prior II.	Aged	Warring and Jennings	Horsham ..	16.7.08	S.S.C.
668	Protest	3 years	E. H. Bell ..	Traralgon Show ..	13.11.07	W.R.
1274	Radiator	5 years	J. W. Welsby ..	Dandenong ..	10.9.08	E.A.K.
898	Radium	3 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
899	Ratawood ..	5 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
316	Red Light ..	Aged	Neyland Bros. ..	Birchip	21.8.07	W.J.C.
1116	Red Wind Jun. ..	Aged	J. Williams ..	Bairnsdale ..	19.8.08	W.R.
343	Royal Whips ..	4 years	A. J. Walter ..	Elmore	26.8.07	W.J.C.
1125	Rex Osterley ..	6 years	T. C. Blain ..	Terang	19.8.08	J.L.
942	Royal Rue ..	Aged	J. Clark ..	Heathcote ..	3.8.08	W.R.
770	Ringleader ..	6 years	Thos. Pearce ..	Stawell	20.7.08	S.S.C.
524	Robin's Pride ..	3 years	A. Armstrong ..	Kyneton ..	26.9.07	W.R.
780	Royal George II. ..	Aged	Chas. Grant ..	Melbourne ..	27.7.08	S.S.C.
1377	Royal Highlander ..	4 years	Thos. Harrop ..	Mildura Show ..	14.10.08	J.L.
250	Rose Musk ..	4 years	J. Bland ..	Yarram ..	21.8.07	N.McD.
402	Rufus	Aged	Smith Bros. ..	Mansfield ..	30.8.07	W.J.C.
125	Safeguard ..	Aged	Evans Bros. ..	Wangaratta ..	15.8.07	S.S.C.
644	Sailor King ..	Aged	H. Gibbins ..	Pyramid Hill Show	23.10.07	W.R.
133	Satellite	Aged	J. Putty ..	Wangaratta ..	15.8.07	S.S.C.
85	Seaforth Highlander	6 years	T. McCrae ..	Swan Hill ..	7.8.07	W.R.
202	Seldom Seen ..	6 years	S. Winter Cooke ..	Hamilton ..	17.8.07	W.R.
330	Selkirk	3 years	A. Scott ..	Elmore ..	26.8.07	W.J.C.
248	Shanet-a-boo ..	6 years	J. J. Sherry ..	Yarram ..	21.8.07	N.McD.
901	Shooting Star ..	5 years	W. Savage ..	Melbourne ..	28.7.08	W.R.
903	Silver King ..	Aged	John Mason ..	Melbourne ..	28.7.08	W.J.C.
210	Solicitor	3 years	J. T. Oram ..	Minyip	21.8.07	W.R.
939	Sparrowhawk ..	5 years	J. Langford ..	Kerang	24.7.08	W.R.
994	Spectator	Aged	W. Shelswell ..	Euroa	7.8.08	W.J.C.
763	Spight	3 years	G. Haensler ..	Horsham ..	16.7.08	S.S.C.
91	St. Patrick ..	—	A. Shebler, jun. ..	Melton	10.8.07	S.S.C.
128	Stamp	Aged	Kettle & Moroney	Wangaratta ..	15.8.07	S.S.C.
1257	Standish	3 years	L. P. Davis ..	Maryborough ..	11.9.08	W.J.C.
25/2	Standish Direct ..	2 years	W. Walter ..	Ballarat Show ..	12.11.08	W.R.
1146	Starlight	4 years	H. Anderson ..	Berwick ..	21.8.08	W.R.
212	Steel Arab ..	6 years	M. McLean ..	Minyip	21.8.07	W.R.
2/4	Storm	2 years	E. S. Metcalf ..	Romsey	14.8.08	W.J.C.
84	Strathlodden ..	Aged	T. Wickens ..	Swan Hill ..	7.8.07	W.R.
502	St. Swivan ..	6 years	M. Gargan ..	Mirboo North ..	24.9.07	N.McD.
1275	Sultan	4 years	M. McKenna ..	Dandenong ..	10.9.08	E.A.K.
239	Sunfish	4 years	W. Kennedy ..	Nhill	21.8.07	S.S.C.
67	Sunlight	Aged	A. E. Carter ..	Colac	7.8.07	S.S.C.
963	Sunlight	3 years	R. Biggar ..	Numurkah ..	4.8.08	S.S.C.
1039	Swagman	3 years	R. J. Knott ..	Rainbow ..	11.8.08	E.A.K.
1378	Swiveller Shamrock ..	4 years	W. Crosbie ..	Mildura Show ..	14.10.08	J.L.
702	Sir Harold ..	Aged	H. Bainbridge ..	Agricultural Offices	6.3.08	W.J.C.
905	Sir Roger	—	W. F. Foster ..	Melbourne ..	28.7.08	W.R
367	Sir Simon ..	—	D. Campbell ..	St. Arnaud ..	28.8.07	W.J.C.
61	Sir Wyhee ..	3 years	W. Connor ..	Colac	7.8.07	S.S.C.
575	Talk o' the Hills ..	Aged	S. R. Klinge ..	Dimboola Show ..	11.10.07	S.S.C.
887	Tallis Pride ..	3 years	D. D. Tuttle ..	Agricultural Offices	1.8.08	J.L.
494	Tallis W.	4 years	J. T. Smith ..	Stawell	18.9.07	W.R.
1379	Taradale	Aged	R. F. Holland ..	Mildura Show ..	14.10.08	J.L.
940	Tenant	Aged	G. Sharp ..	Kerang	24.7.08	W.R.
595	Terrific	Aged	Jas. Blenheim ..	Maryborough Show	16.10.07	S.S.C.
503	Testator	4 years	Arthur Knight ..	Agricultural Offices	8.10.07	S.S.C
353	The Brook ..	4 years	D. McLeod ..	Echuca	24.8.07	W.J.C
1233	The Cadet ..	5 years	A. C. Bair ..	Leongatha ..	9.9.08	E.A.K.
404	The Deemster ..	Aged	G. E. Kipping ..	Mansfield ..	30.8.07	W.J.C.
462	The Governor ..	5 years	John Gooden ..	Warrnambool ..	10.9.07	W.J.C.
1100	The Grader ..	3 years	James Dyson ..	Port Fairy ..	18.8.08	J.L.
1354	The Judge ..	6 years	E. Francis ..	Yarrawonga Show	23.9.08	J.L.
1409	The Kaffir ..	5 years	G. B. Mackie ..	Camperdown Show	26.11.08	E.A.K.
1027	The Masher ..	Aged	T. H. Skene ..	Romsey.. ..	14.8.08	W.J.C.
495	The Merchant ..	4 years	Oliver Bodey ..	Stawell	18.9.07	W.R.
741	The Pet of the Public	3 years	Gus Krause ..	Horsham ..	16.7.08	S.S.C.
1347	The Swell ..	Aged	Geo. McDonnell ..	Ballan	26.9.08	W.J.C.
1030	The Toff	6 years	W. Peacock ..	Agricultural Offices	15.8.08	W.R.
553	The Trick ..	Aged	Jas. Fisher ..	Warracknabeal Show	3.10.07	N.McD.
552	Thunder Jewell ..	3 years	R. Hetherington	Minyip Show ..	1.10.07	N.McD.

LIST OF CERTIFICATED STALLIONS—*continued.*

LIGHT HORSES—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
175	Tidegate	Aged	Thos. Austin ..	Maffra	16.8.07	W.J.C.
1266	Togos	Aged	Riley Bros. ..	Ballarat ..	11.9.08	W.J.C.
565	Tommy Huon ..	4 years	J. G. Hodgson ..	Numurkah Show .	9.10.07	W.J.C.
1095	Toxo	Aged	T. J. Doherty ..	Shepparton .	22.8.08	W.J.C.
1319	Tracey Alto ..	3 years	J. Kelly ..	Inglewood .	18.9.08	W.R.
1053	Trickster	6 years	W. Craig ..	Warracknabeal ..	14.8.08	W.R.
261	Triumph	4 years	T. Nelson ..	Cobram ..	23.8.07	N.McD.
59	True Sign ..	Aged	G. H. Hill ..	Colac	7.8.07	S.S.C.
388	Truro	4 years	R. McInroy .	Casterton ..	28.8.07	W.R.
1198	Tynedoch Legislator	4 years	R. G. Wilson, jun.	Royal Show	28.8.08	W.R.
1017	Unknown	Aged	T. H. McEwan ..	Benalla .	3.8.08	W.J.C.
1267	Vendetta	5 years	R. F. Howard ..	Ballarat .	11.9.08	W.J.C.
190	Vengeance II. ..	4 years	G. Hausler ..	Warracknabeal ..	14.8.07	W.R.
92	Venture	4 years	J. Cockbill ..	Melton .. .	10.8.07	S.S.C.
214	Victor's Pride ..	3 years	P. Doyle ..	Minyip	21.8.07	W.R.
156	Volant	4 years	Jas. Clark ..	Yarrawonga ..	16.8.07	S.S.C.
425	Von Osterley ..	6 years	F. R. Heard ..	Geelong ..	31.8.07	S.S.C.
489	Walnut	Aged	G. Burgess ..	Daylesford .	20.9.07	W.J.C.
776	Wangoola ..	Aged	J. Potter ..	Goroke ..	21.7.08	S.S.C.
1276	Warrior King ..	5 years	J. New	Dandenong ..	10.9.08	E.A.K.
1199	Waterloo	Aged	J. Ellis	Royal Show .	28.8.08	E.A.K.
134	Welfare	Aged	F. Holmes ..	Wangaratta .	15.8.07	S.S.C.
1200	Wenlock	3 years	A. L. Barclay ..	Royal Show ..	28.8.08	W.R.
195	Whalebone ..	Aged	W. R. Cross .	Hamilton	17.8.07	W.R.
274	Why Not	3 years	O. Dutton .	Shepparton	7.9.07	S.S.C.
550	Wildbird	—	H. Bincham ..	Hamilton Show ..	19.9.07	N.McD.
158	Willie Wilkes ..	3 years	M. Rowan .	Yarrawonga ..	16.8.07	S.S.C.
530	Woodstock ..	Aged	Dickens Bros. ..	Kyneton ..	26.9.07	W.R.
374	Yamba	6 years	— Smith, junior ..	St. Arnaud ..	28.8.07	W.J.C.
1083	Yelretso	Aged	W. H. Wallis ..	Bendigo ..	19.8.08	W.J.C.
1346	Yendon	6 years	W. Payne ..	Ballan .. .	26.9.08	W.J.C.
384	Yettendon ..	Aged	A. Bond ..	Casterton .	28.8.07	W.R.
45	Young Ashplant ..	Aged	J. E. Morgan ..	Pyramid Hill ..	3.8.07	S.S.C.
656	Young Bow Boy ..	3 years	T. Upstill ..	Maldon Show ..	30.10.07	S.S.C.
5/2	Young Brigham ..	2 years	A. McCure ..	Colac	18.8.08	W.J.C.
1374	Young Clarendon ..	6 years	J. M. Wilson ..	Portland ..	7.10.08	W.J.C.
324	Young Cureton ..	3 years	Major McLeod ..	Lilydale ..	23.8.07	W.J.C.
1040	Young Dragon ..	6 years	A. R. Lush ..	Rainbow ..	11.8.08	E.A.K.
1138	Young Grand Prix ..	5 years	J. McKenna ..	Donald	19.8.08	E.A.K.
298	Young Hamlet ..	Aged	John Head ..	Kaniva	28.8.07	N.McD.
1399	Young Highlander ..	Aged	W. Hicks ..	Orbost	28.8.08	E.A.K.
371	Young Irrtum .	—	— Fithall ..	St. Arnaud ..	28.8.07	W.J.C.
1167	Young Jester ..	—	J. Bourke ..	Kyabram ..	24.8.08	W.R.
82	Young King Louis ..	6 years	W. Ross ..	Swan Hill ..	7.8.07	W.R.
1395	Young Kintore ..	Aged	G. Morris ..	Colac Show .	29.10.08	W.R.
1168	Young Middlemarch	Aged	J. Bourke ..	Kyabram ..	24.8.08	W.R.
372	Young Osterley ..	Aged	W. McDonald ..	St. Arnaud ..	28.8.07	W.J.C.
924	Young Osterley II. ..	4 years	Jas. McDonald ..	Sea Lake ..	22.7.08	W.J.C.
412	Young Pieman ..	5 years	M. McLean ..	Mansfield ..	30.8.07	W.J.C.
325	Young Richmond ..	Aged	E. Fontaine ..	Lilydale ..	23.8.07	W.J.C.
1033	Young Swiveller ..	Aged	H. Naylor ..	Beulah	13.8.08	W.R.
150	Young Tynon ..	Aged	W. Rugge	Sea Lake ..	15.8.07	N.McD.
243	Young Vengeance ..	3 years	E. Hull .	Nhill	21.8.07	S.S.C.
95	Zonroff	Aged	J. Mims .	Melton	10.8.07	S.S.C.

PONIES.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
1237	Admiration ..	5 years	S. O'Callaghan ..	Warrnambool ..	10.9.08	W.R.
622	Admiration ..	5 years	T. T. Taylor ..	Ballarat Show ..	17.10.07	S.S.C.
512	Aladdin	Aged	R. Kelly ..	Camperdown ..	26.9.07	W.J.C.
584	Alma Jimmy ..	3 years	G. Willatts ..	Maryborough Show	16.10.07	S.S.C.
1259	Arabi	3 years	G. J. Phillips ..	Ballarat ..	10.9.08	W.J.C.
975	Argyle	Aged	W. Conner	Wangaratta ..	5.8.08	W.J.C.
1252	Badaween ..	5 years	E. S. Herring ..	Maryborough ..	11.9.08	W.J.C.
635	Bally	Aged	J. F. King ..	Colac Show ..	24.10.07	S.S.C.
1401	Bally Boy	3 years	W. G. Illingworth	Ballarat Show ..	12.11.08	W.R.
433	Bally Rogan ..	3 years	J. E. Jellett ..	Geelong ..	31.8.07	S.S.C.
431	Bally Roy ..	4 years	A. J. Spalding & Sons	Geelong ..	31.8.07	S.S.C.
1048	Baltimore ..	5 years	A. O'Meara	Warracknabeal ..	14.8.08	W.R.
516	Bay Briton ..	Aged	P. Wahrton ..	Elmore Show ..	25.9.07	W.R.
306	Bell Boy	6 years	J. D. Pryse ..	Wycheproof ..	20.8.07	W.J.C.
1400	Bengal	Aged	J. Ford ..	Ballarat Show ..	12.11.08	W.R.

LIST OF CERTIFICATED STALLIONS—*continued*.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			PONIES—continued.			
791	Berkeley Magician	Aged	R. G. Wilson, jun.	Melbourne	27.7.08	W.R.
301	Bill	Aged	J. Grinham	Casterton	28.8.07	W.R.
772	Black Bolt	3 years	H. Redford	Goroke	21.7.08	S.S.C.
476	Black Boy	3 years	F. Bridges	Morwell	16.9.07	W.J.C.
827	Black Prince	Aged	Staley & Connell	Swan Hill	7.8.07	W.R.
573	Bobbie Burns	Aged	R. H. Wright	Dimboola Show	11.10.07	S.S.C.
1161	Bobs	Aged	T. A. Mackenzie	Kyabram	24.8.08	W R.
1235	Bonnie Boy	Aged	W. H. Spooner	Bunyip	9.9.08	W.R.
985	Bounding Willow	5 years	Hugh McCue	Murchison	6.8.08	S.S.C.
452	Bower	Aged	M. Quigley	Warrnambool	10.9.07	W.J.C.
1110	Boxer	Aged	E. Glenn	Bairnsdale	19.8.08	W.R.
241	Brassey's Pride	5 years	A. E. Millar	Nhill	21.8.07	S.S.C.
1239	Brigham	Aged	J. Jenkins	Warrnambool	10.9.08	W.R.
541	Brigham	3 years	S. Blakeley	Horsham Show	27.9.07	S.S.C.
1223	*Brigham II.*	*Aged*	*J. G. Schneider*	*Hamilton*	*25.8.08*	*J.L.*
1134	*Brigham King*	*8 years*	*A. P. Jones*	*Donald*	19.8.08	E.A.K.
68	Brigham Young II.	Aged	A. E. McCure	Colac	7.8.07	S.S.C.
450	Brigham Young II.	Aged	J. Hall	Warrnambool	10.9.07	W.J.C.
1015	Bronzewing	Aged	V. Little	Benalla	3.8.08	W.J.C.
497	Bryce	—	C. McKay	Stawell Show	18.9.07	W.R.
1070	Bull Jinks	Aged	F. Osborne	Bendigo	19.8.08	W.J.C.
70	By Night	4 years	Hunt Bros.	Dookie	27.7.07	W.J.C.
317	Canary	Aged	G. Gould	Birchip	21.8.07	W.J.C.
441	Caractacus II.	Aged	Farrell Bros.	Warrnambool	10.9.07	W.J.C.
1148	Caradoc	3 years	C. D. Hobbs	Geelong	20.8.08	J.L.
596	Cardiff	4 years	J. L. Edwards	Iona	21.10.07	W.J.C.
1149	Celtic Chief	4 years	C. Grant	Geelong	20.8.08	W.J.C.
141	Chief Justice	5 years	T. Moroney	Wangaratta	15.8.07	S.S.C.
747	Clem	3 years	P. Doyle	Horsham	16.7.08	S.S.C.
1121	Clem	3 years	J. Crimmin	Terang	19.8.08	J.L.
14	Clifton	Aged	L. Lynch	Mirboo	25.10.06	S.S.C.
1000	*Cocaine*	Aged	W. R. Cullen	*Rutherglen*	6.8.08	W.J.C.
1044	Cock of the Walk	Aged	R. McKenzie	Dimboola	12.8.08	E.A.K.
568	Cocoanut	Aged	D. J. Ferguson	Seymour Show	11.10.07	W.J.C.
636	*Combine*	*Aged*	..	*Colac Show*	*24.10.07*	S.S.C.
640	Comet	4 years	A. Billings	Colac Show	24.10.07	S.S.C.
429	Comet	—	Alf. Beales	Geelong	31.8.07	S.S.C.
692	Comet	—	*W. Ritchie*	Bunyip Show	26.2.08	W.R.
8	Comet	Aged	Talbot Atkins	Korumburra	29.9.06	S.S.C.
48	Commander	Aged	W. Townsend	Pyramid	3.8.07	S.S.C.
1011	Commodore	Aged	Quinlan & McLean	Minyip	12.8.08	W.R.
432	Commodore	Aged	Jno. Ince	Geelong	31.8.07	S.S.C.
1232	Commodore	6 years	A. Rickards	Foster	8.9.08	E.A.K.
1390	Commonwealth	6 years	E. W. Tremellan	Numurkah Show	23.10.08	E.A.K.
1393	Commotion	6 years	Alex. McKenzie	Colac Show	29.10.08	W.R.
1294	Courtier	3 years	R. B. Kelly	Lilydale	17.9.08	E.A.K.
1211	Crofton	4 years	Jas. Hortle	Casterton	26.8.08	W.J.C.
509	Crown King	5 years	J. Dwyer	Camperdown	26.9.07	W.J.C.
204	*Cymro*	*Aged*	*J. R. Jackson*	*Hamilton*	17.8.07	W.R.
173	Cyndette	6 years	J. A. Manson	Maffra	16.8.07	W.J.C.
459	Dan Daphne	3 years	J. Stafford	Warrnambool	10.9.07	W.J.C.
1313	*Dandy*	*Aged*	*Dolman Bros.*	*Coleraine*	*19.9.08*	W.J.C.
466	Dandy	3 years	R. Rennie	Alexandra	14.9.07	W.J.C.
666	Dandy	6 years	G. Tory	Traralgon Show	13.11.07	W.R.
390	*Dandy*	*Aged*	*A. Bilston*	*Casterton*	*28.8.07*	W.R.
638	Dandy Bell	5 years	Jno. James	Colac Show	24.10.07	S.S.C.
1185	Dandy Boy	Aged	G. & W. Lord	Sale	7.9.08	W.R.
851	Dandy Brush	4 years	J. Findlay	Melbourne	28.7.08	W.R.
470	Dandy Dick	6 years	J. Findlay	Alexandra	14.9.07	W.J.C.
1151	Dandy Don	Aged	G. R. Bowman	Geelong	20.8.08	J.L.
1270	Dandy Hero	Aged	E. Fontaine	Dandenong	10.9.08	E.A.K.
251	Dandy Geordie	4 years	T. G. McKenzie	Yarram	21.8.07	N.McD.
107	Dandy Imperial	4 years	J. P. Morgan	Donald	14.8.07	W.J.C.
570	Dandy Jock	5 years	A. Ward	Seymour Show	11.10.07	W.J.C.
1098	*Dandy Jock*	*Aged*	*D. Dawe*	*Port Fairy*	*18.8.08*	*J.L.*
667	Dandy Junior	5 years	Widdis & King	Traralgon Show	13.11.07	W.R.
987	Dandy King	3 years	E. Mackie	Murchison	6.8.08	S.S.C.
1271	Dandy Lad	3 years	A. E. Selman	Dandenong	10.9.08	E.A.K.
650	*Dandy Lad*	*3 years*	*J. Donegan*	*Murchison Show*	30.10.07	W.R.
852	Dandy Lyons	Aged	J. O'Neil	Melbourne	28.7.08	W.R.
1288	Dandy Prince	6 years	E. H. Miller	Whittlesea	15.9.08	J.L.
854	Dandy Scott	4 years	*J. Findlay*	Melbourne	28.7.08	W.R.
39	Dandy's Pride	3 years	W. Widdis	Traralgon	31.7.07	S.S.C.
415	Dandy's Pride	Aged	C. Jones	Geelong	31.8.07	S.S.C.
853	Dandy's Progress	3 years	Fred Jones	Melbourne	28.7.08	S.S.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			PONIES—continued.			
1402	Desert Born ..	Aged	A. J. Fisken ..	Ballarat Show ..	12.11.08	W.R.
824	Desert Lad ..	3 years	D. Shelly ..	Ballarat Show ..	17.10.07	S.S.C.
1212	Despised	Aged	Stock Bros. ..	Casterton ..	26.8.08	W.J.C.
180	Diagram	4 years	W. Ramey ..	Maffra	16.8.07	W.J.C.
1099	*Dingo*	*Aged*	*R. H. Gibson* ..	*Port Fairy* ..	18.8.08	*J.L.*
253	Duffy	5 years	J. McKenzie, jun.	Yarram ..	21.8.07	N.McD.
51	Emulator, jun. ..	5 years	Franklin & Scown	Hopetoun ..	3.8.07	W.J.C.
1123	*Era*	5 years	*E. Boland* ..	*Terang*	*19.8.08*	*J.L.*
1163	Ethelator	Aged	J. W. West ..	Kyabram ..	24.8.08	W.R.
949	Ettrickdale ..	5 years	W. Cock ..	Melbourne ..	5.8.08	W.R.
262	Fast Time ..	4 years	K. Stewart ..	Cobram	23.8.07	N.McD.
116	Federation ..	5 years	R. Davidson ..	Euroa	14.8.07	S.S.C.
14/2	Fiction	2 years	J. A. Marriage ..	Royal Show ..	28.8.08	E.A.K.
1406	First Clem ..	3 years	D. Rowe ..	Camperdown Show	26.11.08	E.A.K.
64	First Landor ..	5 years	Geo. Connor ..	Colac	7.8.07	S.S.C
375	Flashwood ..	5 years	Jno. Griffin ..	St. Arnaud ..	28.8.07	W.J.C.
480	Forest Boy ..	6 years	L. Fawkner ..	Morwell ..	16.9.07	W.J.C.
542	Galloway	..	.. ..	Horsham Show ..	24.9.07	S.S.C.
1375	*Galway*	*5 years*	*B. Conole* ..	*Portland* ..	7.10.08	*W.J.C.*
547	Garfield	Aged	R. A. Gibson ..	Hamilton Show ..	19.9.07	N.McD.
1024	Garnet	4 years	J. T. Ingram ..	Romsey ..	14.8.08	W.J.C.
1130	*General*	*Aged*	*P. H. Satchwell* ..	*Camperdown* ..	*19.8.08*	*J.L.*
281	Gladstone ..	Aged	— Collins ..	Tatura	24.8.07	W.R.
457	Glengarry ..	..	T. W. McCullough	Warrnambool ..	10.9.07	W.J.C.
23/2	Golden King ..	2 years	J. Simmons ..	Warragul ..	24.9.08	W.R.
959	Gratis	..	R. Crawford ..	Numurkah ..	4.8.08	S.S.C.
917	Greywood ..	Aged	P. Glasheen ..	Charlton ..	23.7.08	W.J.C.
628	Grey Steel ..	6 years	S. McNabb ..	Maffra Show ..	24.10.07	W.J.C.
63	Griffo	Aged	T. Daffy ..	Colac	7.8.07	S.S.C.
1104	Gulliver	3 years	Rd. Crowle ..	St. Arnaud ..	18.8.08	E.A.K.
205	Hamilton Emulator Junior	5 years	W. H. Horn ..	Hamilton ..	17.8.07	W.R.
620	*Harlequin* ..	*4 years*	*J. Daniel* ..	*Ballarat Show* ..	17.10.07	S.S.C.
444	Heather Jock ..	Aged	R. Baltis ..	Warrnambool ..	10.9.07	W.J.C.
238	Heather Lea ..	Aged	Elson & O'Keefe..	Nhill	21.8.07	S.S.C.
1206	*Here It Is* ..	4 years	*W. E. Rosling* ..	*Royal Show* ..	28.8.08	*J.L.*
101	Here's Luck ..	4 years	F. C. Thomas ..	Warracknabeal ..	15.8.07	W.R.
1333	Highlandman ..	Aged	W. Peacock ..	Warragul ..	24.9.08	W.R.
1391	Jack Spratt ..	Aged	Paterson Bros. ..	Numurkah Show	23.10.08	E.A.K.
94	Jimmy Governor ..	Aged	Wm. Nosedale ..	Melton	10.8.07	S.S.C.
1360	J.M.	5 years	Jos. Anderson ..	Corryong ..	3.10.08	E.A.K.
13	Jno. Gilpin ..	6 years	J. Patterson ..	Mirboo	25.10.06	S.S.C.
680	Johnny O'More ..	6 years	Jno. McDonald ..	Grantville and Jeetho Show	16.1.08	W.R.
193	Jno. Osterley Junior	4 years	Thompson Bros. ..	Warracknabeal ..	14.8.07	W.R.
1361	Jubilee	Aged	T. B. Waters, jun.	Corryong ..	3.10.08	E.A.K.
435	*Kaizer II.* ..	*Aged*	*A. S. O'Keefe* ..	*Royal Show* ..	7.9.07	S.S.C.
1334	Kelpie	Aged	G. Freckleton ..	Warragul ..	24.9.08	W.R.
1136	King	6 years	W. H. Morgan ..	Donald	19.8.08	E.A.K.
619	King Bally ..	Aged	Downey & *Lumsden*	Ballarat Show ..	17.10.07	S.S.C.
623	King Bally's Pride ..	3 years	F. J. Ellsworth ..	Ballarat Show ..	17.10.07	S.S.C.
52	King Billy ..	Aged	H. Jenkins ..	Hopetoun ..	3.8.07	W.J.C.
501	King James ..	5 years	Wm. Johnson ..	Mirboo North ..	24.9.07	N.McD.
1300	King Jimmie ..	Aged	P. Pearce ..	Smeaton ..	17.9.08	J.L.
6	King Jimmy ..	4 years	E. Wilson ..	Korumburra ..	29.9.06	S.S.C.
593	King Jimmy ..	Aged	R. Tankard ..	Maryborough Show	16.10.07	S.S.C.
1387	*King Jimmy II.* ..	5 years	T. Larcombe ..	Geelong Show ..	21.10.08	W.J.C.
1171	Landmark ..	5 years	W. J. Cannon ..	Condah	26.8.08	J.L.
373	Larry Boy ..	..	F. Clover ..	St. Arnaud ..	28.8.07	W.J.C.
176	Lawyer	*Aged*	J. A. *Cooper* ..	*Maffra*	18.8.07	W.J.C.
1301	Lee Rose	Aged	J. J. Sullivan ..	Smeaton ..	17.9.08	J.L.
386	Leetch	Aged	A. Ferguson ..	Casterton ..	28.8.07	W.R.
299	Leopard	Aged	H. Baldock ..	Kaniva	28.8.07	N.McD.
888	Little Bert ..	3 years	A. W. Ragg ..	Agricultural Offices	1.8.08	W.R.
1328	Little Jack ..	3 years	R. J. Argyle ..	Kyneton ..	24.9.08	W.J.C.
167	Little Jim.. ..	Aged	P. J. McAuliffe ..	Benalla	17.8.07	S.S.C.
637	Little Jim.. ..	6 years	H. E. Beard ..	Colac Show ..	24.10.07	S.S.C.
1411	*Little Johnnie* ..	3 years	Jno. Hancock ..	Colac	28.11.08	E.A.K.
1324	Little Mick ..	3 years	N. Aitken ..	Kyneton ..	24.9.08	W.J.C.
242	Little Pride ..	Aged	W. H. Treloar ..	Nhill	21.8.07	S.S.C.
521	*Little Tich* ..	*5 years*	*W. Hogan* ..	Kyneton ..	26.9.07	W.R.
219	Little Wonder ..	Aged	J. White ..	Minyip	21.8.07	W.R.
707	Little Wonder ..	3 years	Mitchell & O'Brien	Melbourne ..	14.7.08	S.S.C.
403	Little Wonder ..	Aged	*F. McDonald* ..	Mansfield ..	30.8.07	W.J.C.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Ponies—*continued.*			
890	Llandor ..	Aged	W. Nebel ..	Agricultural Offices	1.8.08	W.R.
740	Llandovery ..	5 years	J. Phillips ..	Agricultural Offices	18.7.08	W.R.
1413	Llewyn True Blue ..	Aged	G. L. Wilson ..	Melbourne (Special)	21.12.08	W.J.C.
496	Lord Brassey ..	Aged	A. E. Miller ..	Stawell Show ..	18.9.07	W.R.
499	Lord Brassey II. ..	Aged	A. Miller ..	Rupanyup ..	20.9.07	W.R.
40	Lord Dandy ..	5 years	Jas. Alexander ..	Traralgon ..	31.7.07	S.S.C.
484	Lord Roberts ..	6 years	J. Biggar ..	Korumburra ..	29.9.06	S.S.C.
1013	Mahomet	..	A. Brown ..	Minyip	12.8.08	W.R.
442	Marbro	Aged	J. Davidson ..	Warrnambool ..	10.9.07	W.J.C.
1106	Masher Boy ..	Aged	Bilton Bros. ..	St. Arnaud ..	18.8.08	E.A.K.
1215	Mick	Aged	W. Sealey, jun. ..	Casterton ..	26.8.08	W.J.C.
76	Mickey Free ..	Aged	J. McInerney ..	Dookie	27.7.07	W.J.C.
140	Midnight	Aged	J. O'Brien ..	Wangaratta ..	15.8.07	S.S.C.
486	Minstrel	3 years	R. N. Scott ..	Korumburra ..	29.9.06	S.S.C.
17	Monowai	Aged	S. Perrin ..	Mirboo	25.10.06	S.S.C.
1312	My Own	6 years	Jno. Minns ..	Melton	18.9.08	J.L.
1107	Najar Reed ..	4 years	J. Bray ..	St. Arnaud ..	18.8.08	E.A.K.
320	Nelson	Aged	White Bros. ..	Lilydale ..	23.8.07	W.J.C.
341	Newbold	Aged	Thos. Brown ..	Elmore	26.8.07	W.J.C.
991	Nick-a-Jack ..	6 years	J. Silver ..	Tallangatta ..	7.8.08	W.R.
148	Nigger	Aged	P. Quick ..	Sea Lake ..	15.8.07	N.McD.
1264	Orion	Aged	W. Shaw ..	Ballarat ..	11.9.08	W.J.C.
981	Parsee	Aged	Witherow Bros. ..	Wangaratta ..	5.8.08	W.J.C.
106	Pasha	..	— Bones ..	Donald	14.8.07	W.J.C.
393	Peep of Day ..	Aged	W. G. Hicks ..	Seymour ..	29.8.07	W.J.C.
1403	Pippin	Aged	Harrison Bros. ..	Ballarat Show ..	12.11.08	W.R.
217	Planet	5 years	Neil McGilp ..	Minyip	21.8.07	W.R.
252	Planet	Aged	W. Raven ..	Yarram ..	21.8.07	N.McD
385	Pluto	Aged	J. M. Scott ..	Casterton ..	28.8.07	W.R.
215	Polo	Aged	Quinlan & McLean	Minyip	21.8.07	W.R.
379	President	6 years	A. & D. Parry ..	St. Arnaud ..	28.8.07	W.J.C.
1327	Preston	5 years	McClure and Son	Kyneton ..	24.9.08	W.J.C.
1373	Prospect	Aged	Jake Pill ..	Portland ..	7.10.08	W.J.C.
478	Prince Bally ..	6 years	J. J. O'Mara ..	Morwell ..	16.9.07	W.J.C.
1020	Prince Leo II. ..	3 years	R. F. Watson ..	Agricultural Offices	15.8.08	W.R.
669	Prince Leo Junr. ..	3 years	J. E. Phillips ..	Heidelberg ..	13.11.07	S.S.C.
621	Quercus	6 years	A. E. Callow ..	Ballarat Show ..	17.10.07	S.S.C.
694	Quicksilver ..	Aged	P. Dore ..	Bunyip Show ..	26.2.08	W.R.
941	Ranji	Aged	J. Sangster ..	Heatchote ..	3.8.08	W.R.
671	Reuben	Aged	R. P. Nicol ..	Yarram Show ..	20.11.07	W.J.C.
1281	Rhyll	Aged	McMillan Bros. ..	Lang Lang ..	11.9.08	E.A.K.
65	Rhymney	5 years	C. T. Lucas ..	Colac Parade ..	7.8.07	S.S.C.
601	Robert	3 years	Vandamme and Foster	Coburg	23.10.07	N.McD.
992	Robin	2 years	W. E. Trollope ..	Donald	19.8.08	E.A.K.
172	Rob Roy	..	J. R. & H. J. Manson	Maffra	16.8.07	W.J.C.
192	Rob Roy	6 years	W. J. Clarke ..	Warracknabeal ..	14.8.07	W.R.
1392	Rob Roy	6 years	Hugh Burke ..	Numurkah Show	23.10.08	E.A.K.
1364	Rory's Pride ..	Aged	A. W. Acocks ..	Corryong ..	3.10.08	E.A.K.
139	Rosslyn	..	J. B. Bryan ..	Wangaratta ..	15.8.07	S.S.C.
531	Roy	3 years	Summerhill Stud Farm	Kyneton ..	26.9.07	W.R.
113	Roy	3 years	F. Von Kusseron	Euroa	14.8.07	S.S.C.
900	Roy	Aged	W. Pitcairn ..	Melbourne ..	28.7.08	W.J.C.
1208	Roy	Aged	F. E. Smith ..	Royal Show ..	28.8.08	E.A.K.
1108	Rush Harold ..	4 years	W. T. Boulton ..	St. Arnaud ..	18.8.08	E.A.K.
774	Rusty	Aged	Thos. Grace ..	Goroke	21.7.08	S.S.C.
1196	Royal Fauntleroy ..	4 years	P. D. Ferrier ..	Royal Show ..	28.8.08	J.L.
66	Royal Robin (dead)	Aged	H. A. Hancock ..	Colac	7.8.07	S.S.C.
1217	Saccholoni ..	Aged	G. McLyon ..	Casterton ..	26.8.08	W.J.C.
1117	Sahara	Aged	P. S. Ryan ..	Bairnsdale ..	19.8.08	W.R.
467	Sam Weller ..	Aged	Jno. Hicks ..	Alexandra ..	14.9.07	W.J.C.
369	Shamrock ..	Aged	A. Ross ..	St. Arnaud ..	28.8.07	W.J.C
25	Shamrock ..	6 years	Gildea Bros. ..	Horsham ..	18.7.07	S.S.C.
1197	Shamrock ..	4 years	Jas. May ..	Royal Show ..	28.8.08	W.R.
962	Shanter II. ..	Aged	Wm. Patterson ..	Numurkah ..	4.8.08	S.S.C.
771	Shanter Again ..	6 years	Chas. McKay ..	Stawell	20.7.08	S.S.C.
759	Shanter's Ghost ..	5 years	E. McIntyre ..	Horsham ..	16.7.08	S.S.C.
203	Shroff King ..	Aged	Alf. Bates ..	Hamilton ..	17.8.07	W.R
1126	Shylock II. ..	Aged	Fred. Coy ..	Terang	19.8.08	J.L.
639	Silverbells ..	Aged	W. H. Boston ..	Colac Show ..	24.10.07	S.S.C.
1014	Silver Boy ..	Aged	R. Glover, jun. ..	Minyip	12.8.08	W.R.
775	Silver King ..	Aged	A. B. Burns ..	Goroke	21.7.08	S.S.C.
1209	Silver Prince ..	4 years	J. Prout ..	Royal Show ..	28.8.08	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			PONIES—*continued.*			
983	Simson	Aged	J. Simson	Wangaratta	5.8.08	W.J.C.
409	Siva Junr.	5 years	G. F. Elliott	Mansfield	30.8.07	W.J.C.
357	Skipper	4 years	T. Gray	Echuca	24.8.07	W.J.C.
761	Skylark	Aged	Copping Bros.	Horsham	16.7.08	S.S.C.
690	Sloper	3 years	T. Patullo	Bunyip Show	26.2.08	W.R.
443	Smithills Fireboy	3 years	W. B. Harper	Warrnambool	10.9.07	W.J.C.
906	Snapshot	Aged	F. H. Walsh	Melbourne	28.7.08	W.R.
168	Soda	Aged	— Rogash	Benalla	17.8.07	S.S.C.
597	Souter Johnnie Junr.	Aged	Kelly and Zimmerman	Donald	14.8.07	W.J.C.
992	Sovereign	4 years	J. McDonald	Tallangatta	7.8.08	W.R.
566	Speculation	Aged	S. Archibald	Numurkah Show	9.10.07	W.J.C.
689	Sprightly	Aged	C. J. Bradbury	Leongatha Show	11.2.07	S.S.C.
394	Steel Arrow	Aged	H. Sawyers	Seymour	29.8.07	W.J.C.
430	Subadah	Aged	R. W. Noble	Geelong	31.8.07	S.S.C.
285	Sultan	Aged	H. Gordon	Tatura	24.8.07	W.R.
31	Sultan	Aged	W. Baker	Horsham	18.7.07	S.S.C.
1297	Sunbeam	Aged	Mrs. B. Folliott Sandford	Lilydale	17.9.08	E.A.K.
1005	Sunbeam	3 years	W. Church	Dookie	8.8.08	E.A.K.
515	Sunrise	6 years	Blight Bros.	Elmore Show	25.9.07	W.R.
1337	Sir Fauntleroy	..	F. A. Gilbertson	Warragul	24.9.08	W.R.
904	Sir Hector	Aged	H. Doig	Melbourne	28.7.08	W.J.C.
7	Sir Richard III.	5 years	Clarke Bros.	Korumburra	29.6.06	S.S.C.
1003	Sir Rupert	6 years	J. McInerney	Dookie	8.8.08	E.A.K.
665	Taffy	5 years	A. Williams	Traralgon Show	13.11.07	W.R.
909	Taffy	Aged	C. Piffero	Melbourne	28.7.08	W.J.C.
510	Tam	Aged	— Quinn	Camperdown Show	26.9.07	W.J.C.
166	Tam O'Shanter	6 years	H. Burness	Benalla	17.8.07	S.S.C.
583	Tam O'Shanter	Aged	J. M. Jones	Jeparit Show	16.10.07	W.J.C.
1066	Tam O'Shanter	3 years	T. Purcell	Colac	18.8.08	W.J.C.
338	Teviot	Aged	J. Spark	Elmore	26.8.07	W.J.C.
479	Timmy	Aged	G. Bond	Morwell	16.9.07	W.J.C.
471	Tommy	4 years	Jno. Turner	Alexandra	14.9.07	W.J.C.
1384	Tommy Bent	5 years	R. London	Bendigo	14.10.08	E.A.K.
1047	Tommy Bent	4 years	Harry Jenz	Jeparit	13.8.08	J.L.
47	Tommy Dod	Aged	S. S. Davey	Pyramid Hill	3.8.07	S.S.C.
263	Tony	4 years	W. Kennedy	Cobram	23.8.07	N.McD.
995	Toney II.	4 years	M. Hagan	Euroa	7.8.08	W.J.C.
1172	Trump	Aged	A. W. Thompson	Condah	26.8.08	J.L.
914	Twilight	4 years	Alf. Neave	Melbourne	28.7.08	W.R.
527	Tyrone	Aged	A. W. Harvey	Kyneton	26.9.07	W.R.
487	The Bohemian	5 years	C. J. Colgan	Korumburra	18.9.07	W.J.C.
177	The Count	5 years	T. B. Anderson	Maffra	16.8.07	W.J.C.
15	The Dude	..	— Hall	Mirboo	25.10.06	S.S.C.
1410	The Gaffer	5 years	Jno. R. Mallinson	Camperdown Show	26.11.08	E.A.K.
910	The King	4 years	J. Widdis	Melbourne	28.7.08	W.J.C.
1340	The Lad	4 years	F. H. Beasley	Warragul	24.9.08	W.R.
389	The Masher	3 years	Tompkins Bros.	Casterton	28.8.07	W.R.
1234	The Masher	Aged	Harper Wasson	Leongatha	9.9.08	E.A.K.
138	The Premier	..	F. W. Briggs	Wangaratta	15.8.07	S.S.C.
387	The Souter	Aged	Tompkins Bros.	Casterton	28.8.07	W.R.
697	The Warrior	4 years	— McKoy	Tallangatta Show	5.3.08	W.J.C.
695	The Welsh Prince	Aged	Mrs. B. Folliott Sandford	Lilydale Show	4.3.08	W.R.
1345	Uncle Sol	Aged	Jno. McDonald	Horsham Show	25.9.08	S.S.C.
206	Utah	Aged	Malcolm Bros.	Hamilton	17.8.07	W.R.
1173	Vanity	Aged	D. Coutts	Condah	26.8.08	J.L.
1182	Victor	6 years	C. Young	Ararat	7.9.08	W.J.C.
915	Victory	4 years	Jno. Bell	Melbourne	28.7.08	W.J.C.
218	Von Atom II.	5 years	G. Padget	Minyip	21.8.07	W.R.
1268	Wanrua	5 years	K. Taylor	Ballarat	11.9.08	W.J.C.
98	Wee Gibbie (Imp.)	4 years	J. Devlin and Son	Murtoa	9.8.07	W.J.C.
967	Wee Mick	5 years	Thos. Heley	Tungamah	4.8.08	W.J.C.
1203	Welsh Flyer IV.	Aged	S. O. and E. N. Wood	Royal Show	28.8.08	J.L.
22/2	Welshman	2 years	Wm. Hogan	Kyneton	24.9.08	W.J.C.
1067	Whalebone	Aged	R. Farquharson	Colac	18.8.08	J.L.
437	What's Wanted	Aged	S. O. Wood	Royal Show	7.9.07	S.S.C.
1079	Wizard	4 years	Jno. Kendall	Bendigo	19.8.08	W.J.C.
512	Young Aladdin	Aged	R. Kelly	Camperdown	26.9.07	W.J.C.
493	Young Australia	5 years	J. A. Dalgleish	Stawell	18.9.07	W.R.
764	Young Bally Golly	Aged	Mrs. J. C. Bullen	Horsham	16.7.08	S.S.C.
69	Young Brigham	4 years	A. S. Lucas	Colac	7.8.07	S.S.C.
1306	Young Brigham	Aged	T. Parkin	Smeaton	17.9.08	J.L.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			PONIES—*continued.*			
1216	Young Brigham ..	Aged	D. McGilp ..	Minyip	21.8.07	W.R.
1385	Young Britain ..	4 years	O. Vegele ..	Bendigo Show ..	14.10.08	E.A.K.
651	Young Briton ..	Aged	J. O'Keefe ..	Murchison Show ..	30.10.07	W.R.
78	Young Briton ..	5 years	W. G. Ballantyne	Dookie	27.7.07	W.J.C.
604	Young Briton ..	..	Heinz Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
1132	Young Clem ..	5 years	J. J. Wiggins ..	Camperdown ..	19.8.08	J.L.
1145	Young Dandy ..	Aged	W. Horswood ..	Berwick ..	21.8.08	W.R.
27	Young Dandy II. ..	5 years	A. E. Officer ..	Horsham ..	18.7.07	S.S.C.
777	Young Docken ..	5 years	M. O'Neil ..	Goroke	21.7.08	S.S.C.
240	Young Doctor ..	Aged	W. Kennedy ..	Nhill	21.8.07	S.S.C.
278	Young Fauntleroy ..	4 years	Wm. McCraw ..	Lang Lang ..	11.9.08	E.A.K.
1540	Young Garfield ..	Aged	.. ..	Horsham Show ..	24.9.07	S.S.C.
327	Young General ..	Aged	W. Marshall ..	Lilydale ..	23.8.07	W.J.C.
1156	Young Gladstone ..	..	M. McCartin ..	Geelong ..	20.8.08	W.J.C.
956	Young Governor Tracy	4 years	J. H. Trickett ..	Nathalia ..	3.8.08	S.S.C.
277	Young Haukam ..	3 years	Jas. Baker ..	Shepparton ..	24.8.07	S.S.C.
11	Young Hero ..	3 years	Alex. Scott ..	Korumburra ..	29.9.06	S.S.C.
408	Young Hero ..	Aged	A. J. Phillips ..	Mansfield ..	30.8.07	W.J.C.
378	Young Hero ..	Aged	T. Moss ..	St. Arnaud ..	28.8.07	W.J.C.
1176	Young Kiki ..	6 years	S. Winter Cooke ..	Condah ..	26.8.08	J.L.
594	Young King Charles	4 years	E. Culvenor ..	Maryborough ..	16.10.07	S.S.C.
1061	Young Leopard ..	5 years	G. Yetman ..	Rainbow ..	11.8.08	E.A.K.
1353	Young Lingcropper	Aged	W. Stewart ..	Yarrawonga Show	23.9.08	J.L.
889	Young Llandor ..	Aged	W. Nebel ..	Agricultural Offices	1.8.08	W.R.
1231	Young Natty ..	3 years	P. Cain ..	Mirboo North ..	8.9.08	W.R.
567	Young Nelson ..	6 years	Jno. Paterson ..	Numurkah Show	9.10.07	W.J.C.
1404	Young Prince Aladdin	6 years	R. E. Ralph ..	Ballarat Show ..	12.11.08	W.R.
574	Young Robin ..	Aged	J. Taylor, jun. ..	Dimboola Show ..	11.10.07	S.S.C.
767	Young Rory O'More	3 years	Jas. Hamilton ..	Horsham ..	16.7.08	S.S.C.
1331	Young Rysharold ..	5 years	J. Brown ..	Kyneton ..	24.9.08	W.J.C.
660	Young Sailor ..	Aged	J. F. Kirby ..	Coleraine Show ..	6.11.07	W.J.C.
1082	Young Sampson ..	6 years	W. Barker ..	Bendigo ..	19.8.08	W.J.C.
1412	Young Shanter ..	4 years	P. Ambler ..	Agricultural Offices	3.12.08	W.R.
500	Young Silver King	5 years	A. T. Darling ..	Rupanyup Show	20.9.07	W.R.
1088	Young Texas ..	3 years	R. A. Bateson ..	Kaniva	15.8.08	E.A.K.
1089	Young Tommy Dod	6 years	F. Saltmarsh ..	Kaniva	15.8.08	E.A.K.

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RECENT PROGRESS AND DEVELOPMENT OF AGRICULTURAL PRODUCTION IN VICTORIA.*

T. Cherry, M.D., M.S., Director of Agriculture.

In dealing with the Recent Progress and Development of Agricultural Production in Victoria, the title which was selected by your Committee as the subject of my address to-day, three conditions must be recognised.

First. Progress in nearly every department of the producing industries has been more or less of a fitful character. While on the whole substantial progress has been made, there has not been the steady expansion which might have been realised with a proper employment of existing conditions of soil and climate, of capital and knowledge.

Second. Many districts, some of them most favoured as far as soil and climate are concerned, have shown retrogression instead of progress.

Third. There is a vast tract of Victoria, representing one-third of the entire State, with a rainfall of from 20 to 30 inches in which progress has been extremely slow, and agricultural interests in many respects have been lying dormant.

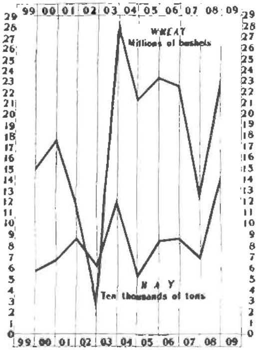
With regard to total production, cultivation had reached an area of 1,500,000 acres in 1880. It had reached 2,000,000 acres by 1890, and 3,000,000 acres by 1900. The area has increased from the latter figure to 3,232,000 acres, and, in addition, about 1,000,000 acres are under fallow every year. The unsatisfactory part of this return is the fact that the area under crop reached its maximum in 1903, and has fallen slightly since that year. Of the total area under crop, 57 per cent. was wheat, 21 per cent. hay, 12 per cent. oats, and 10 per cent. miscellaneous crops, including potatoes, barley, vineyards, and orchards. The most satisfactory part of the return is the steadily increasing yield per acre due to improved methods of farming. The use of phosphatic manures has become almost universal, and the area grown on fallowed ground each year is increasing. Taking the wheat yield as indicating results obtained from the country districts lowest in rainfall, we find that for each five yearly periods since 1885 the average has been as follows:—

1885-9	9.2
1890-4	10.9
1895-9	6.7
1900-4	7.7
1905-9	10.2

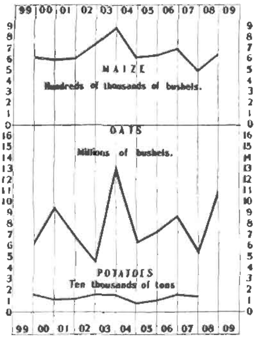
* Address delivered at the Seventh Convention of the Victorian Chamber of Agriculture, held at Bendigo, July, 1909.

That is, the yield has been maintained, although cultivation has been pushed into much less favorable districts than formerly both of soil and climate.

Another very satisfactory feature is the steady advance in the total yield of the oat crop. Previous to 1900, a 5,000,000 bushel crop was attained on four occasions only, whereas during the last ten years the average has been nearly 9,000,000 bushels, fluctuating, however, considerably from year to year.



WHEAT AND HAY PRODUCTION. 1900-1908.



MAIZE, OATS AND POTATOES, 1900-1908.

So much for cultivation. In live stock, a similar tale is told. In horses, the number reached 280,000 by 1880, rose to 436,000 in 1890, and has fluctuated between that figure and 370,000 ever since. At the present time it stands at 424,000. With cattle, including dairy cows, the number registered is 1,286,000 in 1880; 1,782,000 in 1890, and has remained practically at the same figure ever since, the latest returns showing a slight reduction on account of the drought experienced in 1908.

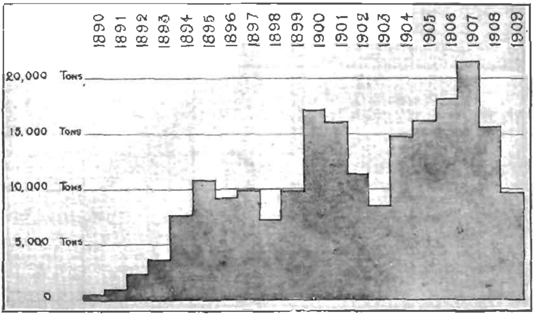
In sheep, the 10,000,000 was reached in 1870. The number was slightly less in 1880; it increased to 12,700,000 in 1890; fell again to 10,000,000 in the early years of the present century, and slowly recovered to a maximum of 14,000,000 in 1907. A slight reduction has again taken place.

Swine reached a maximum of 350,000 in the year 1901. They are now at about 100,000 less, standing at the same figure which was registered in 1880.

The history of the butter trade strikingly bears out the want of steady progress in Victorian agriculture. From its inception in 1890 the export increased to 10,000 tons in four years, remained stationary for the next five years, then increased to 17,000 tons, rapidly declined to 8,000 tons in 1903, slowly increased to 22,000 tons in 1907, and has now fallen back to the position it occupied sixteen years ago.

Fluctuations in the yield of potatoes and of the hay crop exhibited a similar history, and the truth of our original statement about the intermittent character of Victorian agriculture is clearly seen from the accompanying diagrams.

In many districts, some of them most favoured as far as soil and climate are concerned, the last twenty years has exhibited retrogression instead of progress. For instance, of the four counties, Villiers, Dalhousie, Delatite, and Moira, the total area under cultivation has shrunk from 586,700 to 493,200 acres. Villiers comprises the rich land in the neighbourhood of Warrnambool, where cultivation is 28,000, as compared

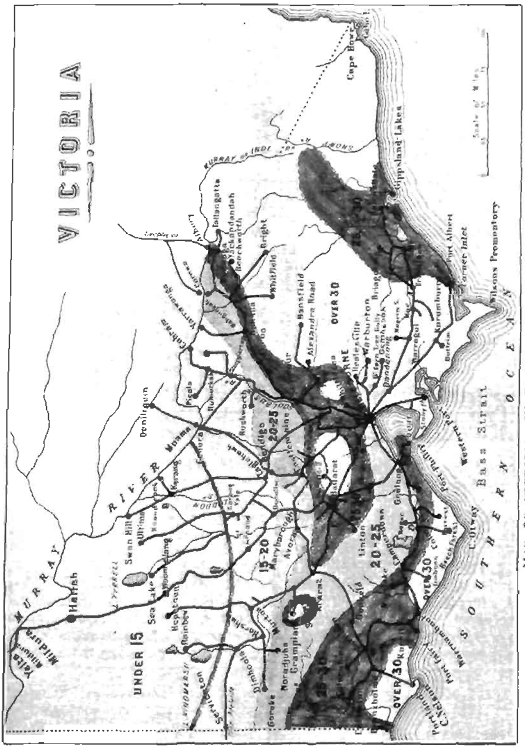


VICTORIAN BUTTER EXPORTS, 1890-1909.

with 27,000 acres ten years ago. There would have been a considerable actual shrinkage if it were not for wheat-growing, which has lately been started in the neighbourhood of Green Vale and Dunkeld, in the north of the county. The chief agricultural districts in Dalhousie are Kyneton and Kilmore. Here, cultivation in ten years has fallen from 49,800 to 43,400 acres, a result which could not in any way have been due to either unfavorable climatic or soil conditions. In Delatite, comprising the large area to the south of the north-eastern line between Longwood and Wangaratta, cultivation has fallen from 44,000 to 39,000 acres, yet there is no evidence of any diminution in the return per acre. The maxima and minima yields for the wheat, oats, hay, and potatoes in these counties as compared with the rest of the State are shown in the following table:—

—	Wheat.		Oats.		Hay.		Potatoes.	
	Bush.		Bush.		Tons.		Tons.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Villiers	27	14	41	23	1·9	1·1	5·75	3·1
Dalhousie	20	12	32	21⅛	1·8	1·1	3·72	1·39
Delatite	20	7¾	34	20½	1·6	0·8	4·21	1·8
Average for State ...	14½	1·3	31	10	1·6	1	3·9	1·9

It will be seen with regard to these returns that the highest maxima are much greater than the highest average for the State, while the minimum



MAP OF VICTORIA, SHOWING AVERAGE ANNUAL RAINFALL.

10—20 inches = 23,232,000 acres 30—40 inches = 12,012,800 acres
20—30 inches = 17,856,000 acres Over 40 inches = 3,144,960 acres

return in the drought year 1903 was $7\frac{3}{4}$ bushels, as against 1.3 for the whole State. Similarly with regard to oats, the maxima are well above

the average for the State, while the lowest yield of 20 bushels is double the lowest average of the State, namely, 10 bushels. Similar facts appear with regard to both hay and potatoes, so that there is no reason to suppose that the falling off in cultivation in these counties is due to conditions more unfavorable than the average with regard to either soil or climate.

As far as live stock are concerned, these three counties show a slight increase in all classes during the past ten years, but the increase is not much greater than that of the State generally. Turning now to the map exhibiting the distribution of the rainfall in the agricultural districts in Victoria, it will be seen that the greater part of the Mallee is north of the line of 15 inches rainfall. Between 15 and 20 inches, we have the southern portion of the Wimmera and the southern parts of the counties of Kara Kara, Gladstone, Bendigo, Rodney, and Moira, the contour line entering the State about 25 miles south of Serviceton, and running through Goroke and Stawell to Maryborough, then curving north to Bendigo, and thence north-east through Rushworth, Shepparton, and Yarrawonga. The shaded portions of the map indicate the parts of the State receiving from 20 to 25 inches (lightly shaded) and 25 to 30 inches (heavily shaded). The unshaded portions included in these areas are the mountain ranges and parts of the southern coast of South Gippsland and East Gippsland receiving over 30 inches per annum. Now, the remarkable thing is that nearly the whole of the cultivation in Victoria is in the areas receiving less than 20 inches of rain, for 3,000,000 out of 4,150,000 acres under the plough are comprised in this area. Of cultivated land in the shaded portions of the map nearly the whole is found in the areas receiving from 20 to 25 inches. The shaded portions represent nearly 18,000,000 acres, or nearly one-third of the total area of Victoria, yet the total cultivation is approximately 1,000,000 acres, or less than one-third of the cultivation carried out in the drier regions of the north. As we have seen from an analysis of the returns in the three typical counties—Villiers, Dalhousie, and Delatite, the returns per acre for all kinds of crops in the region of heavier rainfall are much greater than those in the drier north, and in addition to this a partial failure is never so disastrous as on the northern plains and Mallee. Yet we are faced with the anomalous fact that cultivation has diminished and farmers are depending more and more on the smaller profits to be derived from grazing. Such a state of affairs is highly unsatisfactory, for to my mind it indicates that progress, if possible at all, will be an exceedingly slow process. By far the larger portion of the cultivation in this area is comprised in the newly developed land around Melton, Werribee, and Lara, the wheat-growing areas in Grenville and Ripon, and similar areas in the south of the county of Moira. Nearly all the cultivation is comprised between the limits of 20 and 25 inches rainfall.

The area under question comprises what is undoubtedly the richest land in the best rainfall districts of Victoria. Production per acre should be vastly greater than any other portion of the State, yet farmers have given over cultivation, and are resting on their oars. They are depending upon grazing alone, and hence are at the mercy of every dry season or of any similar unfavorable influence. No conclusion I think is more certain than that the grazing capacity of even the best of the Victorian lands is strictly limited. For instance, in the pick of the western district, a farm realizing £50 per acre will seldom carry more than one cow to three acres all

the year round. None of the grasses are sufficiently deeply rooted to withstand the effects of our normal dry summer. They do not wake into sufficient activity until the rain comes in autumn. Consequently, we find that the grazing capacity and the number of stock carried on the farms in this region is strictly limited. *Cultivation changes all this.* Oats and other fodder crops can be grown with the assistance of the winter rainfall, and ripen before the dry weather of summer sets in. The weight of fodder, whether preserved green in the form of silage, or dry as hay, is at least three times as much as the land will carry from the best natural grasses. Working up the land allows the rain to penetrate more deeply into the subsoil. The growth of deep-rooted leguminous crops becomes a natural process of subsoiling, and enriches the land with nitrogen collected from the atmosphere. Increased fodder means increased stock-carrying capacity. This

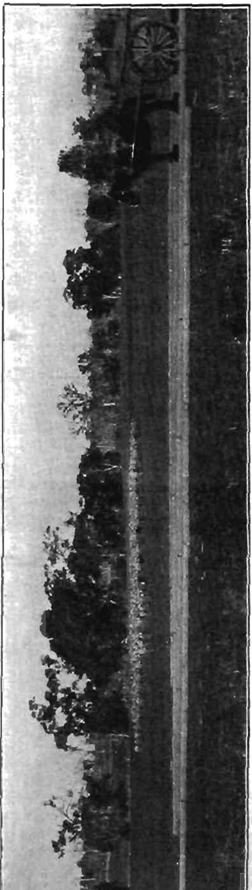
MESSRS. THAIN BROTHERS' SILO.

means increased animal manure incorporated with the soil, and, in addition to this, the essential artificial phosphatic fertilizers can be added much more readily to cultivated land than the ordinary pastures. On many of the stations in the county of Ripon it was boldly prophesied that breaking up the soil would ruin the pasture, yet these stations are carrying more sheep than ever, while at least one-third of their area is under wheat each year. Recently, at Beaufort, I was informed by Mr. Stewart that on one 50-acre paddock he has grown rape and wheat for nine years in succession—five years wheat and four of rape. This year's wheat promises to be the best of any.

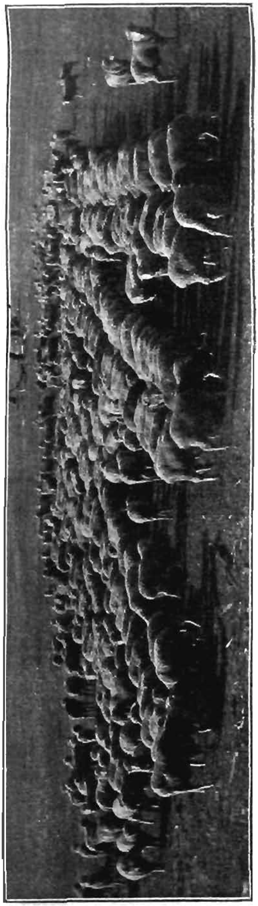
Many more examples might be given of the complete change which can be brought about in the productivity of land by means of cultivation. The comparatively heavy rainfall for the whole of the area under consideration, as compared with the lighter rainfall of the wheat-growing districts, makes for luxuriance of growth of leaf, size and weight of crop, without

necessarily increasing the yield of grain in the same proportion. A crop of hay yielding 2 tons to the acre will, if cut at the right stage, yield more than 7 tons of green fodder per acre. By means of the silo this can be conserved for use at the time of the year when pastures are denuded, and if necessary can be carried on as a reserve store for a number of years in order to meet emergencies. Only those who have had actual experience of the silo can realize the enormous advances which its adoption has brought about in the methods of Australian agriculture. As an example, I may quote Messrs. Thain Brothers at Carapooee. Last November, they filled their silos with a crop of oats grown on 15 acres. They have been feeding it during March, April, May and June to 600 large framed merino ewes and well-grown weaners. The amount consumed by each sheep averages between 1 lb. to 1½ lb. per day, the usual daily ration varying from 800 to 900 lbs. The silage is fed in wooden troughs made of three 6 x 1 flooring boards. These are shifted every few days on to a clean piece of land. Every particle of silage is eaten by the sheep. The troughs are cleaned out as thoroughly as if they had been brushed by hand, and there is no waste silage lying on the ground close to them. A fortnight ago, at the time of my visit, the sheep were feeding in a stubble paddock, and, as you know, this season every stubble paddock has a fairly luxuriant growth of wild oats and self-sown coming on. Messrs. Thain Brothers' paddock was certainly well above the average in this respect. Yet, the moment the sheep saw the cart enter the gate, they instantly headed for the troughs.

Now, consider what this means. A 15-acre crop produces enough fodder to keep 600 ewes and weaners in good condition for three months. This is equivalent to 150 sheep for 12 months, or in other words, by means of cultivation this paddock is made to carry the equivalent of 10 sheep to the acre the



HEADING FOR DINNER.



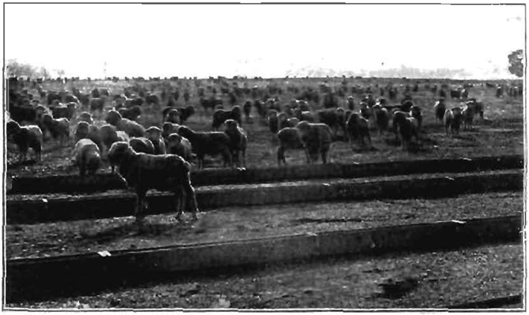
A SATISFYING MEAL.

whole year round. The three months in which they are hand-fed is the critical time of the year. Succulent feed during March, April and May insures the success of the coming lamb and means that its mother will have a good supply of milk. Lambs reared under these conditions are just the ones which can be sold with profit for the export trade six months later on. Such a result cannot be obtained by dry feeding alone. The cost of harvesting the crop, chaffing it into the silo and feeding it to the sheep, including binder twine, is less than 3s. 6d. per ton. What other system can produce equal results, and this in a district where the annual rainfall is only 18 inches?

But silage is only one of the possibilities which may be exploited by means of the plough by the up-to-date farmer. In all the area we have been considering, the extra rainfall means that rape can be grown either as an autumn or a spring crop without much danger of failure. Furthermore, peas can be grown for sheep and for all kinds of live stock with absolute certainty. There is no need to harvest this crop. Pigs or sheep will do this for themselves, and, moreover, the farmer need not worry himself as to whether the crop produces a large number of bushels of grain per acre. The pea crop is at its best when in full flower. Instead of letting it go to grain, if the land is wanted for other purposes, it can be made into hay. Pea hay has exactly the same value as lucerne hay, and all kinds of live stock very soon become exceedingly fond of it. The additional advantages of peas in adding nitrogen to the soil which they have obtained from the atmosphere, and also in producing that kind of food which is richest in the flesh-forming constituents, and therefore most valuable to all kinds of live stock, are two reasons why the area under peas should be steadily extended from year to year.

Again, of all the area under question, summer fodder crops can be

grown for sheep without any difficulty. Maize, millet, sorghum, and rape may all be sown during October, and will give a profitable crop for green fodder in the following January and February. I am concerned now only with these crops so far as they are fed to sheep, and therefore do not claim that the same weight per acre can be produced as when the crop is sown in drills and kept cultivated during the summer months, as is usually done by the dairy farmer. The latter system will certainly give a very much heavier yield per acre. The quality of the resulting crop is also better, and it can all be profitably made into silage, and fed to sheep or cattle. This, however, involves additional labour, and although the extra labour will undoubtedly pay, and pay handsomely, still what I want to point out is that enormous advances can be made in exploiting the area of Victoria in which the rainfall is between 20 to 30 inches without the labour problem presenting insuperable difficulties. In addition, lucerne can be grown over the greater part of the area in question. The chief difficulty in establishing this variety of plant is not the lack of sufficient rainfall in the summer, but the superabundance of rain in the winter, which keeps the soil too wet to allow lucerne to do its best.



AFTER DINNER.

I see no reason why Victoria should not carry as many sheep, and make as much out of them as New Zealand does. Yet, on the average, New Zealand carries twice as many sheep as Victoria, and the exports of meat and wool usually exceed ours by £4,000,000 per annum. It is true their area is somewhat greater, but it is questionable whether this is not more than discounted by the immense and rugged mountain ranges which occupy so large a proportion of the territory of the Dominion. The chief explanation is to be found in the difference which obtains with regard to the area under rape, swedes and artificial grasses in New Zealand. If the 18,000,000 acres of Victoria which we are considering were worked on the same lines, I have no doubt that production could easily be increased to the extent of over £1 per acre, or in other words the cultivation and grazing production in Victoria could at once be doubled.

PROBLEMS IN IRRIGATION DEVELOPMENT.*

Elwood Mead, Chairman, State Rivers and Water Supply Commission.

The irrigation schemes of Northern Victoria already carried out or known to be feasible will irrigate 1,000,000 acres of land. Settled as it should be to secure the full benefits of irrigation this area will support 200,000 more people than now live on it, and if the products equal in value the average returns from small holdings reported to the Commission this year the annual return would be more than £5,000,000. To grade and improve this land, to build the houses, stables and fences required by this area, to equip the farms and handle the products from them would do more to increase trade and give added employment to labour than anything which has occurred since the discovery of gold, and it would secure to Victoria its present relative rank among the States of the Australian Commonwealth for many years to come.

This development is, however, beset by one serious obstacle. Unless it is removed irrigated agriculture in this State is likely to continue for many years a shadowy illusion, seeming more important and substantial the farther one is away from it. The obstacle referred to, is the attitude *toward irrigation of the land-owners of the areas affected.* As a class, they do not believe in irrigated agriculture, and they are not willing to do the things which success in irrigation requires. Until this distrust and dislike are overcome progress will be slow and the ultimate outcome uncertain. That there are exceptions to this general rule is true; there are enthusiastic and successful irrigators in every district, and there are certain districts, like Mildura and Bacchus Marsh, where confidence in irrigation and enthusiasm for irrigated agriculture is the dominating sentiment. But these exceptions only prove the rule, which is, that land-owners do not like small holdings; they object to a change from the present methods of farming and they are unwilling to pay for water what it costs to supply it. This sentiment is not in any way affected by the obvious and easily ascertainable fact that irrigated agriculture is paying handsomely wherever it is followed on right lines.

This opposition to irrigated agriculture, in existing districts, is illustrated by the following statements made in a letter from a landowner in the Rodney district and printed in the *Argus*, of the 30th June:—

> The plain truth is that there is less water being used instead of more, and there are fewer irrigators. Not that the land-owners are fools and cannot see where their best interests lie, or not because they are too well-to-do to trouble their heads over it, but because the bulk of our land is not suited for irrigation, and as we are to our cost becoming aware of this fact, we are letting the water run past in preference to ruining our holdings. The water is cheap enough—too cheap, in fact—but the results obtained from its use, unless in small garden plots, is not such as to induce us to use it freely.

If this statement is true, then the State has wasted a quarter of a million pounds on distributaries in the district. Statements of a similar character have appeared in the press elsewhere. They are definite and they cannot but have an injurious effect on the work of the State in developing new areas or in securing settlers for the older ones, and the disquieting feature is that there does not seem to be enough local loyalty in the district to cause them to be refuted, not a single land-owner in the Rodney district has seen fit to dispute this sweeping condemnation of its

* Paper read at the Seventh Convention of the Victorian Chamber of Agriculture, held at Bendigo, July, 1909.

soil or express any confidence in the value of water. This is all the more remarkable because the Commission knows that on the closer settled, intensively cultivated portions of the district irrigators have had the most gratifying success. The returns this season from small areas of Zante currants reached £50 an acre; and the average return from a considerable number of orchards was over £36 per acre; while the average return from irrigated farm crops on small holdings not intensively cultivated was over £4 an acre.

Distrust like confidence is contagious. The truth of the old adage about giving a dog a bad name was never more fully verified than in the influence exerted by this statement by land-owners in irrigated areas on the minds of landowners in areas to be irrigated. They have heard so much about being taxed off the land by charges for water that irrigation is beginning to assume the aspect of a plague. This was illustrated at Shepparton last Saturday, when a large deputation from the parish of Kialla waited on the Minister of Water Supply to protest against their lands being included in the East Goulburn Scheme. The spokesman for the deputation said that they had opposed the scheme for 20 years, and that if water was offered them for nothing they would not use it, and that if irrigation was forced on them they would sell their holdings and leave. A really pathetic picture was drawn of the pioneer settlers of that district who had carved homes for themselves being driven off their land by this proposed extension of irrigation.

That the farmers in an area contiguous to Rodney should be frightened at the bogey of irrigation after the letter just quoted is only natural. Irrigation to the beginners means the abandonment of a kind of agriculture they understand and beginning a kind in which everything is strange and new, and there is no wonder they are panic stricken when they read that water would ruin the land. No one could talk with the land-owners from Kialla without realizing the weight of anxiety and dread with which they are watching the progress of the East Goulburn works. To say to owners of good soil that this apprehension is groundless does not remove it, nor does it lessen the menace which this distrust presents to the development of the State's irrigation resources. The position of the majority of the deputation from Kialla was well taken. Their land is not suited to irrigation. Even if it had been kept in the district, water would not have been allotted nor would any charge for water have been imposed, but there is also good land in Kialla—land which will under irrigation produce ten times as much as it will without, yet not one of the owners of this land appeared to protest against exclusion, or to claim a share in the benefits of the State's generous outlay on irrigation works.

The Goulburn Irrigation Scheme, of which the East Goulburn referred to is a part, has cost the State an immense sum of money. Developed on right lines, the returns from this expenditure will be all that can be desired. The district has a great combination of natural advantages, and I have never known a new irrigated area where the prosperity of farmers under irrigation is more assured. Notwithstanding this, it is possible here, as it has been in the Rodney district, to have these natural advantages count for nothing, and to have the Goulburn Scheme saddle the State with a loss similar to that incurred in older irrigation districts. The reasons for this are clearly set forth in the *Age* of last Saturday, a portion of which is as follows:—

It is true enough that an immense amount of money has been poured out in constructing irrigation works and building channels; but beyond that—nothing. No

effort has been made to teach the farmers how to utilize the irrigated holdings properly. The water was brought to their lands, and they were left in their primeval ignorance to do with it as they pleased. Naturally in the great majority of cases the farmers pursued the even tenor of their ancient habits. They found the water a useful stand-by in droughty seasons for their stock, but it never occurred to them that it might earn them incomparably larger profits by applying it to the purposes of intense culture all the year round. The consequence is that irrigation in Victoria has been a colossal failure. The irrigation districts, with scarce an exception, instead of being split up into a large number of small intensely cultivated farms, prosperously supporting, as they might, a densely settled population, are divided into a few broad holdings, whose owners do no cultivation worthy of the name. *And the only tangible effect of our lavish expenditure in irrigating those districts has been to increase the value of the land, and thereby to stimulate the vicious process of land aggregation.*

The anomaly of land-owners decrying irrigation and maintaining that land is unfit for irrigation in districts where small holdings are giving large returns, is explained by the fact that those who are not irrigating or paying their fair share of the cost of irrigation works seek in this way to justify their position. In the districts where these complaints are made there is no compulsory charge for water whereby all of the lands benefited must pay a proportionate part of the cost of providing water. In the absence of such a charge those who have not used water have paid nothing, and as the large land-owners have not used it at all, or else used very little, they have thereby been made a favoured class, having the protection of irrigation without paying a fair share of the insurance cost. Nearly all the statements about irrigation being unprofitable and the land unfit for irrigation come from the owners of land in irrigated districts who are seeking to continue to farm them exactly as they did before the channels were built. The man who is using water properly makes no complaint about the cost of water, the man who is not using it at all seeks to justify his action by the statement that it will not pay.

The absence of a compulsory irrigation charge has made the situation in every Northern district agriculturally unsound, and financially indefensible. Being absolutely free to use water, or to let it alone, the large land-owner has most of his land in native grass and follows grain growing and lamb fattening exactly as men are compelled to do in districts without irrigation. If the year is wet he goes through the season without contributing anything to the maintenance of the irrigation works. If the next season is dry he claims his proportionate share of the water based on the land acreage. In partly settled districts those who wish to follow intensive methods of cultivation cannot do so. If they prepare their land and begin to cultivate it properly in the wet years they lose their crops in the dry years through the increased demands of the large holdings. This year the holders of 600 acres and over in the Swan Hill and Cohuna districts did not pay enough for water to buy firewood for the pumps: the holders of 1,000 acres and over, aggregating in all 41,750 acres, in the Rodney district paid £301 for water used in irrigation or less than 1¾d. an acre; one owner of over 2,000 acres invested £1 in water last year—this year he was more prudent and only squandered 13s. 6d.; last year being dry the owner of 3,796 acres paid £96 for water, this year being wet he did not pay a penny; the owner of 1,351 acres paid 8s. for irrigation water last year and nothing at all this. It is allowing owners of the large holdings to escape payment for water that has rendered irrigation works unprofitable, has caused the writing off of so much indebtedness in the past, and has deadened the sense of fair play in irrigation districts. As an illustration of what is meant by fair play:—If I borrow £1 I am under an obligation to do all I can to repay it whether the loan

was profitable or not, and if I am one of ten men who collectively borrow £10 I have no right to shift my obligation to the other nine, even if not satisfied with the results of the loan. In the irrigation districts the large land-owner has not recognised his obligation. The cost of the irrigation works built for his benefit is either being paid by the user of water on small holdings or by the State.

The resolutions passed last week by the land-owners of the Swan Hill irrigation district illustrate the lack of appreciation of the moral obligation assumed when the State at their request provides facilities for irrigation. Before the increased water supply was assured the land-owners of the district gave reiterated assurance that if water was provided they would use it and pay for it. Now, before one season is passed, before it is even known what water will finally cost, the same land-owners meet and declare that it is impossible for a settler to pay 10s. an acre for water and live on the land, and they call on their representatives to oppose the Amending Water Bill because one of its features is to impose a charge which will return from irrigation districts what it costs to supply water. This declaration was made before these land-owners had done anything towards introducing improved methods of cultivation or made any test which would enable them to determine what the value of an improved water supply would be. Now, the experiences at Mildura, Bendigo and many other districts with less natural advantages than Swan Hill show that men can pay far more than 10s. an acre for water and live on the land, and the Amending Water Bill which they ask to have defeated proposes the fairest allocation of cost which can be devised. All the people are required to pay is enough to make the works self-supporting and the benefits of irrigation will enable this to be done whether the charge is 5s. or 10s. an acre.

No one has more sympathy than I with the hard conditions which have confronted the irrigators in many of the districts of Victoria where the water supply is not adequate and where each year they lose a part of their crop because of this; and I have the highest admiration for the patient courage they have shown, but I have no patience whatever with the selfishness of a district which, when given a full supply of water and an opportunity to demonstrate its value, makes no effort whatever to utilize this opportunity but announces in advance that it will not pay and that somebody else must foot the bill.

Every debt written off an irrigation district is transferred to others who had no benefit whatever from the expenditure. It is time for this sort of procedure to stop and that a healthier tone should prevail in these favoured areas. There can be neither equity nor profit in irrigation development until this is brought about. The remedy proposed by the Government is a compulsory charge for water which, beginning with one half of that cost, reaches the full amount in five years. There is no hardship or injustice in this. Where land is properly cultivated irrigation will pay and all who have tested this statement know it is true. The irrigators in the Lerderderg Valley have agreed to pay 15s. an acre foot for water if the State will build a storage work to provide it. Irrigators at Bendigo and Castlemaine pay 25s. an acre foot and the Mildura price is 30s. an acre. The good land at Swan Hill, Cohuna and Rodney will bring as large acreage returns as the lands at Bendigo, Mildura and Lerderderg and if properly cultivated can easily pay the full cost of supplying water. It is true that the farmer who wishes to continue the old methods will find it difficult, but unless he will use the land properly this ought to be so.

In creating irrigated agriculture in this State, subdivision and closer settlement are as necessary as water, but subdivision in new districts has a feature of peculiar difficulty. Much of the land is owned by pioneers who do not want to irrigate or change their farming methods. The pioneer is wedded to the methods he understands; he objects to either adopt new methods or to sell to those who will, and his feeling in this matter is not modified by the fact that the State is willing to pay a fair price for his land and incur all the risk and expense of securing settlers. It becomes a question, therefore, whether it is better to leave conditions as they now are, thus avoiding the opposition to change, or take the necessary steps to bring about a full development.

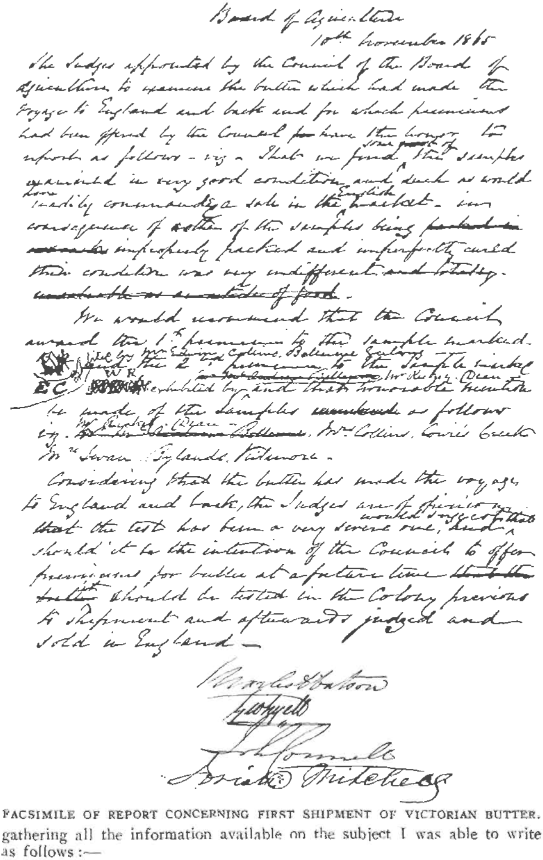
There is no half way course, it should be one or the other. It is a situation in which the inclination of the individual runs counter to the welfare of the State. Every economic change creates situations of a similar character. Those of irrigation will be far less serious than those which have been wrought in many industries by new inventions. The only obstacle to irrigation is that its methods are not understood and its advantages not realized. Those who make the change will not suffer any enduring hardship. On the contrary, I have the fullest confidence that the land-owners who remain in the proposed new districts will, in a few years, regard the conditions of life under irrigation as infinitely superior to those they displaced. But whether this should prove true, or not, does not lessen the responsibility of the State to develop its latent resources. Northern Victoria has now reached a stage in its development when agricultural methods must change if there is to be further growth. At present it is retrograding. Schools in the Goulburn Valley long established have recently been closed for lack of pupils. Sixty farmers left the Rodney district in one month last spring, selling their farms to their neighbours. The aggregations of small holdings is going on faster than the breaking up of large ones. The price of land has risen without a corresponding increase in the value of products, until, as one man expressed it, "It has got so now that a farmer cannot afford to own land." The potential wealth of Northern Victoria is less now than it was ten years ago because the soil fertility is being impaired by wasteful methods of tillage. The extension of irrigation with increase of population and better methods of tillage will change this, but if we are to have success we must work for it.

HISTORY OF THE BUTTER EXPORT TRADE.

R. Crowe, Superintendent of Exports.

A report dealing with the first shipment of Victorian butter to England is herewith reproduced. This interesting document, which was recently discovered by Mr. J. H. Mullaly, Chief Clerk, in one of the Departmental vaults, carries the history of the butter export trade further back than has been hitherto recorded.

In 1899, I wrote an historical sketch of the Butter Industry in Victoria. In order to secure data regarding the first shipment of butter, the earliest factory established, and so on, I had access to official reports and records, and to communications from old residents in the various districts. After



Board of Agriculture
10th November 1865

The Judges appointed by the Council of the Board of Agriculture to examine the butter which had made the voyage to England and back and for which premiums had been offered by the Council have the honor to report as follows — viz — That we found some of the samples examined in very good condition and such as would have readily commanded a sale in the English market — in consequence of others of the samples being improperly packed and imperfectly cured their condition was very indifferent.

We would recommend that the Council award the 1st premium to the sample marked [mark] by Mr Edwin Collins, Bellarine, Geelong — and the 2nd premium to the sample marked W R, Mr Richard Dean, exhibited by and that honorable mention be made of the samples as follows viz. Mr Richard Dean — Bellarine. Mrs Collins, Cowie's Creek. Mr Swan, Eylands, Kilmore.

Considering that the butter has made the voyage to England and back, the Judges are of opinion that the test has been a very severe one, and would suggest that should it be the intention of the Council to offer premiums for butter at a future time it should be tested in the Colony previous to shipment and afterwards judged and sold in England —

Charles Hatton
[illegible]
John Connell
Josiah Mitchell

FACSIMILE OF REPORT CONCERNING FIRST SHIPMENT OF VICTORIAN BUTTER.

gathering all the information available on the subject I was able to write as follows:—

"The late Mr. D. Wilson, in giving evidence before the Royal Commission on Vegetable Products on 18th June, 1886, referred to his modern dairy, established two years before, which was fitted with an engine and separator. He also alluded to an attempt made some eighteen years previous by twenty-three dairymen and himself to ship butter to London. The result, he said, was disastrous, for the

stuff was sold for cart grease; but, undaunted by this failure, he made a very successful shipment in November, 1881. The butter was consigned in the s.s. *Protos*, which sailed in December of that year. It was made up in prints, and sold at 138s. per cwt. in London. There were 38 tons of other dairy butter in the same boat, which was disposed of at 8d. per lb., against Mr. Wilson's return of 14¾d."

According to Mr. Wilson's evidence, eighteen years prior to the date on which it was given, would carry the earliest shipment back to 1868. The document in question, however, takes us to 1865—three years previous.

Reference to the discovery of the report was made in the daily press, and since then I have received the following interesting letter from Mr. William Collins, "Glenlee," Colac:—

> I read with great interest the account of the first shipment of butter from Victoria, more particularly so as my mother was one of the competitors. We were then living at Cowie's Creek, and I well remember the keg in which the butter went to England and back. It was branded "C.B." The keg was in my father's possession until 1901, the time of his death, and I think it is still in existence. I intend making inquiries about it, as it would be an interesting relic to possess. At the present time I have a part of the brand used to mark the tub.
>
> It may interest you to know that my mother came from Devonshire, and thoroughly understood the principle of scalding milk. I remember my father stating that all the milk that went to make the butter in question was scalded, as there was a weed growing at Cowie's Creek which otherwise gave the butter a bitter flavour. I think the butter was used by us after it came back from England.

DAIRYING POSSIBILITIES IN THE SWAN HILL DISTRICT.

F. A. Ryland, Dairy Supervisor.

That there is a large amount of land in the Swan Hill district under irrigation, as well as a still larger area capable or being brought under this system of agriculture, is not generally known to the holders or seekers after land in this State. The Shire as a whole comprises 2,170,880 acres, the largest portion of which (about 2,100,000 acres) is mallee land cultivated, if at all, for the production of wheat only. A total of 200 farms are devoted, more or less, to the dairying industry, but the milking term on mallee land is shortened to an average of five months in the year by an excessive dryness during the early spring and summer months. On mallee land, therefore, it may be said that such dairying as is carried on is at present a winter occupation only.

The remainder of the dairy farms are so situated that their conditions compare very favorably with those in any other part of Victoria. Here, on a stretch of land with a frontage of 25 miles to the Murray River and varying to 4 miles in width, are situated some 29,000 acres of land, which with the combination of summer heat and irrigation facilities only requires systematic working to make it intensely productive. Nevertheless, as often happens, though these exceptionally favorable facilities might be turned to very profitable account by those who are fortunate enough to possess them, in many cases the only result noticeable is a less progressive system of farming. The almost complete absence of subdivision of these large areas also tends to minimise the results which could be obtained if smaller areas were properly farmed. Even where irrigation possibilities are made use of, the returns are seldom as satisfactory as they should be, on account of practically no attention being given to subdivision and to the proper preparation of the land for the purpose of watering artificially.

The Soil.—The soil of this district may be said to be of two varieties:—1. The flat land along the river bank which is dark in colour and heavy to work. 2. The mallee soil which is light and friable, being of a sandy nature.

The flat land has apparently been formed by deposits from the flooding of the river for generations past. Both varieties of soil appear rich in plant foods, particularly nitrogen. This is demonstrated by the strong and rapid growth which all fodder plants make in this district when the required amount of moisture is available. Both grass and fodder crops appear to contain more nutriment than similar fodders in the more southerly districts, the stock fattening more quickly and holding their condition better on a less abundant supply.

Method of Water Distribution.—The rainfall throughout the district averages only 11 inches per annum. Artificial means have therefore to be resorted to for an average supply of this most necessary element of plant growth.

The principal irrigated portion of the district is supplied by a large pumping plant, situated on the Murray, which delivers the supply into several main channels. From these, the various farms are supplied by gravitation through smaller channelling. The control of the system of distribution is in the hands of the State Rivers and Water Supply Commission, and farmers individually pay according to the amount of water used. A large number of farms are not supplied from these channels but depend on their own pumping plants. This entails considerable outlay in the purchase of an engine, pump and fuel. The latter is an expensive item in this district. There are also the wages to be paid to an engine-driver. Nevertheless, all this outlay is more than compensated for by the results obtained from the possession of an independent supply.

Irrigation, as practised in this district, does not produce the best results. Farmers find it difficult to get labour sufficiently skilled to apply the water properly and as a result the work does not receive anything like the attention it should. Preparation of the land in the form of grading and levelling is only in a few instances practised. Draining also is given little consideration. The combined result of overlooking these first principles of irrigation is unevenness in the distribution of the water supply. Patches of dry ground are seen instead of regularly moistened areas; and in other places the soil is inclined to become water logged and sour. When it is considered that all fodder crops, and more especially lucerne, can be very easily destroyed by too much water, or by allowing water to stay on too long, it should be readily seen how important it is that the operation of watering should be properly carried out. If water lies too long on a crop the supply of oxygen to the plant from the atmosphere is cut off. The growth is thereby either checked, or the plant entirely killed. In like manner also, if the draining of the land has not been given proper attention, there is always a danger of the same result being brought about by the over stagnation of water in the soil.

In the mallee portion of the shire are Lake Boga and Long Lake, both of which are filled from the Murray by overflow in flood seasons. From Long Lake a system of channelling extends through a considerable area of mallee country. Water for these channels is taken from the lake by a large pumping plant and distributed by gravitation. Though this work has been in existence for some three or four years, the supply available has up to the present only given sufficient water for stock and domestic purposes. It is hoped, however, that before long the supply will be improved and the system extended to enable irrigation to be carried out.

Should this come about, dairying operations could be put on a more substantial footing by the cultivation of succulent fodder crops over a much larger area. At Nyah, situated on the Murray, 18 miles below Swan Hill, are 2,000 acres of mallee land which have recently been thrown open as an irrigation settlement. This area is cut into blocks varying from 40 to 70 acres each, and the settlement will have its own independent water supply. The main object here, it is understood, is to produce fruit on similar lines to Mildura; but no doubt dairying will be carried on in many instances as the source of revenue until the trees or vines come into bearing.

The Dairy Farms.—The number of dairy farms where irrigation is practised is 81; and the acreage represented is 28,479 acres. The farms vary in area from 47 to 1,700 acres, the average being about 350 acres. From the results obtained by various farmers in the district it is clear that such an arear is far too large for one man to work profitably.

The average number of cows per dairy farm in the irrigable area is 22. While on all these farms a certain amount of cultivation is done for grain crops, the principal industry on the whole is dairying. Here is exceptionally rich land with an abundant water supply, in a climate warm enough to force its vegetation to almost a tropical growth and yet the average farm of 350 acres with dairying as the main source of income only carries 22 cows. The three essential features for the heavy growth of fodder crops are here present, namely, rich land, heat, and moisture; but the pity of it is that there are not three times the number of farmers on the area, working the land as it should be worked and thereby greatly increasing its productiveness as a whole. Given proper attention and treatment this land should carry at the rate of fully one cow to 2 acres the year through. It can therefore be easily seen that the holdings are far too large to be kept up to their full yielding capacity by individual families.

The smallest dairy farm in the irrigable area is that of Mr. J. H. W. Baker, of Tyntynder South, whose holding consists of 80 acres. Ten acres are devoted to fruit-growing and 24 acres of the remainder are cultivated as follows:—5 acres lucerne, 5 acres sorghum, 2 acres millet, and 12 acres oaten hay. Fifteen cows besides some half-dozen farm horses are kept on the remaining 46 acres. In December last, the cows were in milk, yielding an average of 2 gallons per cow daily. With the fodder cut from the cultivation this number of cows is easily kept in milk throughout the year. This owner acknowledges that the remainder of his land could be made very much more profitable if it were brought under cultivation; but he is satisfied with his returns (which for the previous year were £400 gross) as he is not inclined to employ outside labour to any further extent at present.

Lucerne Growing.—Lucerne is eminently suited to this district and it is the staple fodder crop grown; but the method of cultivation adopted does not conduce to the production of the greatest quantity per acre. The general practice is to sow the seed broadcast at the rate of 8 to 12 lbs. per acre, then as soon as the paddock is sufficiently well established, graze it off. Another method is to sow in drills with a cereal crop which acts as a cover and protection to the young plants. As the cereal crop ripens it is cut, leaving the young lucerne to grow until fit for grazing.

The final results from either of these methods are unsatisfactory inasmuch as in either case the young plant does not receive the chance to develop. Furthermore, the trampling of the young plants by grazing cattle on these heavy black soils, and the biting out of the crowns of the

plant by the animals tends to shorten the life of the plant and consequently the productiveness of a lucerne paddock. The term of profit of a paddock under this treatment ends in from four to six years, during which time it has not given anything like the yield it would have if it had been cut instead of grazed, and towards the end of the term mentioned it has become dirty with weeds and the lucerne more scattered and unproductive.

For improvement on the above wasteful method, the main points to be kept in mind are that lucerne, to develop good crowns, must be sown thinly and the land kept in such condition as to enable the plants to become firmly established and properly developed. These points can be gained by sowing thinly in drills, say 8 or 9 inches apart, and harrowing at frequent intervals after the young plants have become established. This cultivation will help to keep down weeds; and, better still, it will break the surface crust, and conserve moisture, if practised after it has been irrigated. An implement, similar to that used for the cultivation of cereal crops after they are up, would meet the purpose.

Lucerne should never be grazed but should be cut and fed either green or as hay. Grazing is a wasteful method of harvesting lucerne and does not give the plant a chance to do its best. The crop should be allowed to make its full growth before being cut. The exact time for cutting may be set down as when the main part of the crop is out in flower. If a set of harrows is run over the paddock after each cutting it will improve it greatly by loosening or opening out the individual sets of the plant and dragging out weeds. A paddock under this treatment may be expected to give good returns for at least twelve years and produce several cuttings per year.

Other Fodder Crops.—Though perhaps oats may be said to be the principal crop grown for green fodder in most parts of the State, this is not so in this district. Here it is only grown by the farmer who has no lucerne—whether due to the fact that he has not given the latter a proper trial on his farm, or on account of his not having sufficient water to irrigate it. It is also often apparent that the owner is too dilatory to make any systematic trial of lucerne and shelters his negligence behind the statement that "lucerne will not grow here."

As elsewhere, the oats are fed by grazing off the early growth and the crop is subsequently allowed to mature for hay, or a grain crop. Cows milk well when so fed but the source of supply does not last long enough and can also be easily overdone.

Ambercane and Japanese millet are both popular as summer crops in the irrigation district, and some big yields are obtained. Like most other summer fodder crops, those named come in abundantly for feeding purposes only at the one season of the year.

As in other parts of the State, the dairy farmers here have yet to adopt silage methods in order that they may profitably conserve their bulky crops in a succulent condition for later use during the autumn and winter months.

One fodder crop, however, which is totally neglected and for no apparent reason is maize. It is a crop which lends itself most especially to the conditions prevailing here, namely good soil, abundant water supply, and warm climate. While lucerne as a fodder crop may be said to stand in a class by itself on account of its high nutritive value, still when placed in comparison with maize, the bulk of fodder obtainable per acre from this latter crop enables it to outweigh lucerne on the question of profit. No matter whether there is an abundant supply of water available or not, the

yield obtainable from maize will always outweigh that from lucerne and under fairly dry conditions there is no comparison. In this district two crops of maize per year could easily be grown. Under irrigation, this would mean 50 tons of green maize per acre per year, and no lucerne crop can come near this as a fodder producer. The combination of these two fodders on every farm would, however, be the most desirable, for, with the bulk of the one and the high nutritive quality of the other, the dairyman should be able to obtain maximum returns from his dairy herd.

It is interesting to note that farmers, even under the present crude working system, have begun to realise the value of this land. This is shown by its buying value having increased from £4 per acre in 1903 to £13 and over at the present time. When up-to-date methods are more generally adopted throughout the district this price will probably be considerably higher, for even the best farms in the district are as yet not worked up to half their producing capacity.

SPRING LOSSES OF BEES.

R. Beuhne, President, Victorian Apiarists' Association.

In apiaries in various parts of Victoria and New South Wales the increase of production of honey and beeswax, as well as the number of hives controlled by individual bee-keepers, has been considerably checked during recent years owing to heavy losses of bees in spring. These losses are experienced at intervals of one or two years. Spring losses also occur in the Northern hemisphere, where they appear to be due to dysentery. Although we experience losses from the same cause, the "dwindle" or disappearing of bees in Australia differs so much in symptoms and effects from dysentery that it is looked upon as a distinct trouble. In dysentery, the bees become bloated and die in or near the hive, with wings and legs in normal position, or rather, closer to the body, as distinguished from bee paralysis when the wings and legs are extended even before death. In the dwindle, no dead bees, other than the few present even in the case of normal colonies, are found in or near the hive. The bees apparently leave the hive in quest of stores and fail to return. Their inability to do so is due to exhaustion and chill—the consequence of impaired vitality. The latter is the result of malnutrition in the larval stage, caused by a deficiency of protein in the pollen used in the preparation of the larval food. This was fully explained by Dr. Cherry in an address on "The Growth of the Grub," at the Annual Conference of Apiarists some years ago. Thus, a deficiency of nitrogen in the larval food causes the disappearing trouble with the adult bee, while the nitrogenous matter in the honey consumed by the adult bee during winter, if present in maximum qualities, is the cause of dysentery. Taking this as a fact, it should follow that during active work and brood rearing there would be no dysentery and no disappearing should take place in a spring succeeding a season of normal pollen supply.

Both these inferences are now well proved by the observations, experience, and experiments of apiarists, extending over a period of six years in localities widely distributed over this State and New South Wales. It is now generally recognised that certain honeys are totally unsuitable as winter food for bees, excepting in the rare instances of a very mild winter allowing continuous activity of the bees. Honey from ironbarks gathered late in the season and from grey box, under certain conditions,

are classed as the most unsuitable in Victoria, while in Northern America, honey dew, and in Germany, heather honey, occupy the same position.

As to the nitrogenous matter in honey being of either animal or vegetable origin, there is still some doubt, although the researches of Professor Josef Langer Graz, as published in *Leipziger Bienen Zeitung* (January, February, and March, 1909), prove that the albumen in honey is a secretion of the bee and the means of inverting the sugar of nectar, and in this way, together with the elimination of surplus water by the bee, creating the honey as found in the combs of the hive. Assuming that this secretion or ferment is of animal origin, it follows that it is likely to be affected by variations in the health and vigour of the bees producing it. This would, in turn, alter the character of the honey stored, as well as that of the larval food, and thus influence the health of the adult bee during inactivity, in the first instance, and the vigour of the future generation in the second.

ONE SIDE OF A GERMAN BEE-YARD SHOWING TIERS OF SKEPS.

At present, Australian bee-keepers have no suitable substitute for pollen to prevent losses from dwindling, and no practical means of forestalling, dysentery. A thorough investigation, scientific as well as practical, would probably discover a remedy in one or both and might possibly establish an inter-relation between disappearing and dysentery.

In the heather country in the North of Germany, bees are still kept in skeps, which have been reverted to, even by those who changed to frame hives. It is the practice there to sulphur swarms for the new comb honey they contain, which is heather honey, and retain, for stock, the skeps from which the swarms have come and which contain clover and Linden honey. With bar-frame hives, the latter went into the supers from which it was extracted, while the brood chamber was filled by the bees with heather honey for winter stores and bad wintering or total loss followed. Thus the bar-frame hive got the blame which was due to the methods adopted; the result is that skeps are universal.

The illustration shows one side of a square bee-yard of 120 skeps formed by four tiled sheds with two tiers of skeps under each, the bees towards the inside. This apiary belongs to Mr. F. Hedder and is situated right in the village of Raven near Winsen, Germany.

TRAFALGAR MAIZE CROP COMPETITION.

J. M. B. Connor, Dairy Supervisor.

REPORT TO THE SECRETARY, TRAFALGAR AGRICULTURAL SOCIETY.

The crops as a whole were very disappointing and certainly not worthy of the district. The time has arrived when more attention will have to be paid to the variety and selection of maize to be sown in the district. On the majority of farms there was marked evidence of a general mixture of seed and there were numerous instances of poor germination of seed. Mr. Peter Stewart's crop was a striking illustration of the necessity of testing the seed before sowing. Out of twenty-five maize seeds sown in a test plot by Mr. Stewart only three seeds germinated, or equivalent to 12 per cent. germination.

The first plot inspected was that of Mr. James Brannigan, Trafalgar. The soil was of a grey clayey nature. It was in grass the previous year, ploughed in winter, and sown the last week of November with Golden King variety drilled in two feet apart and at the rate of one bushel of seed to the acre with a Planet Junr. machine. The cultivation consisted of one scarifying and moulding between the rows. The seed had germinated very unevenly; height of crop averaged about 7 ft. 6 in. and weighed about 18 tons 13 cwt. to the acre. The approximate yield was estimated by weighing a uniform area of each crop judged. Cobs were well formed and there was a fair amount of good quality succulent leaves. The crop was not as free as it might have been from thistles and hogweed, and through this neglect and the bad germination of seed, points were lost. Total points 75.

The soil of Mr. Walter Giblett's plot, Moe Swamp, was of a black peaty nature and was in grass last year. The seed, 50 lbs. per acre, was sown in drills 2 feet apart, and the resulting crop averaged about 7 ft. 3 in. in height and weighed about 15 tons 3 cwt. to the acre. The crop was very uneven in places and appeared to have been checked at some period of its growth by frost. The land was clean and well cultivated, and the headlands were sown with peas. There was a good bulk of leaves, but not much substance in the stem. The plants had stooled and cobbed well. Total points 69.

Mr. Peter Stewart's plot was sown on 2nd October with the Flat Red variety, drilled 3 feet apart and at the rate of 12 lbs. of seed to the acre; average height of crop 6 ft. 6 in.; weight about 12 tons 3 cwt. to the acre. The seed had germinated very badly. The crop was thin, and was almost ripe at time of judging. The leaves were dry and withered, and the general appearance of the crop as a fodder crop was bad. It was very dirty with weeds of all kinds, and showed great neglect as regards after-cultivation, and therefore lost heavily in points. Total points 41.

Mr. James Grant's plot, Moe Swamp.—This crop was the highest of those inspected and averaged about 9 feet. Seed sown was the Sydney White Horse Tooth variety (25 lbs.). It had stooled freely, but the growth was uneven in places and the cobs half formed. Not as free from weeds as sorrell and thistles as it should have been. Germination of seed very uneven in places. Total points 63.

Mr. Alfred Dean, Moe Swamp.—An entirely different soil. It consisted of a grey clay mixed with peat with a yellow clay subsoil. The land had been in pasture for previous five years. It was ploughed once, disc harrowed twice, and during the first week in October was sown broadcast with seed at the rate of 1½ bushels of Yankee Flat Red variety to the acre. This was a very even crop, and averaged about 8 feet in height. It stooled and cobbed fairly well and weighed about 22 tons 3 cwt. to the acre. Owing to it being broadcasted it lost points in feeding value; it was also inclined to be dirty with sorrell, docks, sour thistles and young blackwood trees. This farm generally showed industry and enterprise, but the present system of broadcasting the seed maize might be improved on next year by drill-sowing the seed. The land should be broken down much finer by surface cultivation before sowing. Total points 71.

The following are the details of the points awarded:—

Order.	Name.	System of cultivation and cleanness of crop.	Care and selection and number of varieties sown.	Quality of crop, bulk of leaves and stems.	Quantity of seed sown per acre.	Approximate yield per acre.	Total points.
—	——	25	10	25	10	30	100
1	James Brannigan ...	20	7	20	8	20	75
2	Alfred Dean ...	15	7	17	7	25	71
3	Walter Giblett ...	22	7	17	6	17	69
4	James Grant ...	20	7	15	6	15	63
5	Peter Stewart ...	0	5	11	10	15	41

The plots judged far from complied with the full educational requirements of the competition.

Too much dependence is usually placed upon pasture for summer feeding and your district is no exception to this rule. At best, this system of dairy farming is uncertain; the wise farmer will insure a high yield during the summer months, by providing a succession of green succulent crops which can be fed to his dairy herd when pastures fail. Pasturing high-class land like that in this much favoured district is not putting it to its best use. No dairyman who has ever grown maize under proper conditions would forego the advantages derived from its cultivation.

I was more than surprised to find that there was not a silo to be seen in your district, which is one that lends itself so admirably to intense cultivation. The silo is a necessary part of the equipment of any fully profitable dairy farm, and its value is highly appreciated by feeders of all kinds of live stock. Silos would be particularly advantageous in your district because they constitute a cheap and effective means of disposing of the large number of deleterious weeds so prevalent throughout the district. To secure large yields and economical results it is essential that some succulent foods be fed to the herds during the summer and winter months. This can be effectively done by conserving the weeds and plant rubbish which at the present time are allowed to germinate and spread over the country; at the same time the land will be cleaned at a nominal cost. I cannot understand how farmers are so blind to their own future welfare in allowing their valuable farms to be over-run with dodder, thistles, fire weeds, and other equally obnoxious weeds.

BUILDING HINTS FOR SETTLERS.

I. Plan and Description of a Four-roomed Weatherboard Cottage.

A. S. Kenyon, C.E., Engineer for Agriculture.

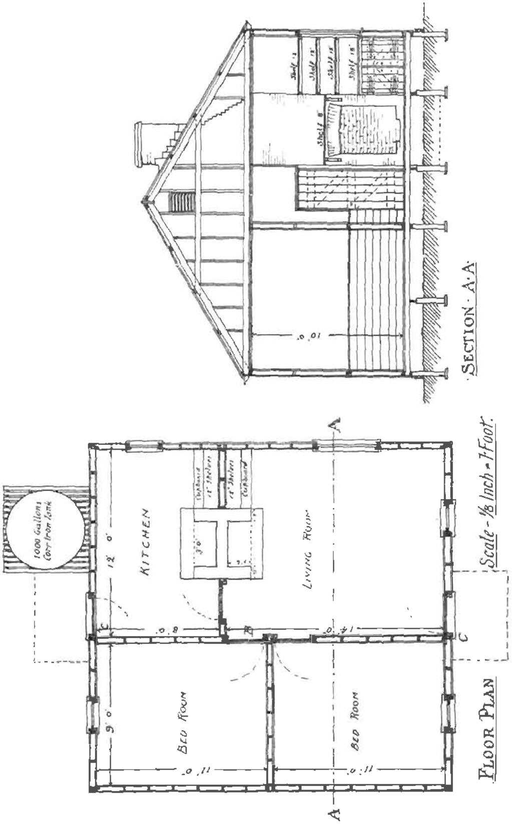
The accompanying illustrations show the plan, section and details of weatherboard cottages now being erected on the Government Experimental Farms at Marlo, Rosedale, and Moe for the accommodation of the managers. The strictest economy consistent with a good job has been observed in their construction. Hardwood is used throughout, except for joinery and lining.

The building stands upon 4 in. x 4 in. red gum stumps, spaced not more than 4 ft. centre to centre under walls nor more than 6 ft. centres under floors, sunk deep enough to obtain a good bottom but not less than 18 in. These stumps can be made from bush timber split. The floor is $4\frac{1}{2}$ in. x $\frac{7}{8}$ in. T and G hardwood on 4 in. x 2 in. joists supported on 4 in. x 3 in. bottom plates and sleepers. Hardwood is much more serviceable as flooring than Baltic pine and costs about the same, but is not always procurable. When hardwood cannot be obtained, 6 in. x $1\frac{1}{8}$ in. T and G white Baltic pine is recommended. Steps of 6 in. x 2 in. red gum are fixed to the external doors. The studs are 4 in. x $1\frac{1}{2}$ in. spaced not more than 18 in centre to centre, with 4 in. x 2 in. window and door studs and 4 in. x 4 in. corner studs, checked and well skew nailed into 4 in. x 2 in. top and vermin plates. The studs are well braced with 3 in. x 1 in. battens let into studs, top plate, and vermin plate, and stiffened with 4 in. x 2 in. hardwood between studs at levels of top of dado and top of windows. The ceiling joists are 5 in. x $1\frac{1}{2}$ in., spaced 2 ft. 6 in. centres, and lined on the underside with 6 in. x $\frac{5}{8}$ in. T and G and beaded lining.

The roof is constructed of 4 in. x $1\frac{1}{2}$ in. rafters, spaced 2 ft. 6 in., centres having one 4 in. x $1\frac{1}{2}$ in. collar tie to each pair of rafters, and 9 in. x $1\frac{1}{4}$ in. ridge, the rafters being well nailed to ceiling joists, collars and ridge. The roof of the Marlo cottage is covered with 26 gauge galvanized iron on 3 in. x $1\frac{1}{2}$ in. purlins, spaced not more than 3 ft. centres. The roof of the other cottages are covered with roofing felt on 6 in. x $\frac{5}{8}$ in. T. and G. and beaded lining. The cost of the felt roofing with the lining costs about £5 10s. more than 26 gauge corrugated iron. As the felt will keep the building much cooler in summer and warmer in winter than the iron, it is considered to be worth the extra cost. The spouting (4 in. galvanized iron, 24 gauge) is fixed with strong galvanized iron straps to each rafter and connected by 3 in. down pipes to 1,000 gallon corrugated iron tank.

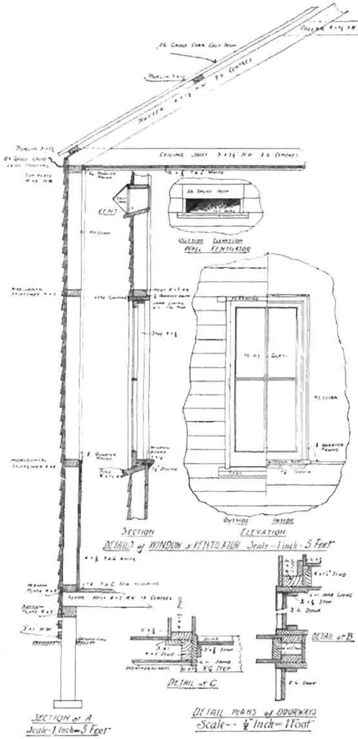
The studs are covered on the outside with hardwood weatherboards having a 2 in. lap. On the inside they are lined with 6 in. x $\frac{5}{8}$ in. T. and G. and beaded lining to a height of 4 feet. The studs above lining are covered with hessian up to the ceiling. The width of hessian, which is 6 feet, exactly fills this space. A $\frac{3}{4}$ in. quarter-round mould is planted over hessian on the top of the dado, in the angles of the walls and ceiling and round door and window frames, making a neat finish and helping to keep the hessian evenly stretched. Two boxed wall vents fixed near the ceiling are provided in each room, with fly wire faces inside and out, and protected from the weather on the outside with a galvanized iron

hood. A hood is constructed over front and back doorways, on strong brackets bolted to the framework of building.



PLAN OF SETTLER'S FOUR-ROOMED WEATHERBOARD COTTAGE.

The window and door openings are lined with 6 in. x 1 in. California pine jambs having 2 in. x $\frac{5}{8}$ in. stops planted on. The doors are constructed of 6 in. x $\frac{7}{8}$ in. ledges and braces covered with 6 in. x $\frac{5}{8}$ in. T. and



G. and beaded lining, furnished with rim locks and hung on strong T hinges. The windows are 1¾ in. casement sashes of four lights glazed with 16 oz. glass hung on strong butt hinges and furnished with necessary fasteners, bolts and hooks.

Brick fireplaces are built in living room and kitchen: the flues are gathered in quickly above opening, bent to obscure daylight, and finished off smoothly. A colonial oven is fixed in kitchen fireplace, and brick hobs with dished bottom are built in the open fireplace of living room. A cupboard with shelves above is constructed between chimney breast and outside wall in kitchen and living room. Two dozen hat and coat hooks on 6 in. rail will be fixed in convenient positions in the various rooms.

The cost of the material in Melbourne, using the felt roofing, is about £68, and the labour about £36: total £104. Where it is not possible to procure bricks, a single iron chimney and fireplace could be used on an outside wall. This would mean a saving of about £7.

"DEVIL'S GRIP" IN MERINO SHEEP.

H. W. Ham, Sheep Expert.

"Devil's Grip," as this fault is called, is found immediately behind the shoulder blades, or more correctly, above that portion of the forequarter where the loin flesh (or chops) and the shoulder blades meet. It is indicated by a dark line, usually semi-circular, following the shape of the shoulder blades, not immediately on the edge, but an inch or two

back. It varies from two to eight inches in length, and from half an inch to an inch in width, and from a dark thin line of yolk on the surface to an inch in depth. In bad cases the wool is without body and character.

With merino sheep there are several other defects more serious than devil's grip, from a yield per head point of view, but it (devil's grip) is one of the greatest eyesores. The appearance of it creates a bad impression, and in breeding stud sheep for sale, one should work with the view of producing a good first impression. Devil's grip is found more in merinoes than in the mutton breeds.

In all our wool breeds we find a close relationship between flesh and wool. Wool grows best on sheep in good store condition—sheep that are evenly fed throughout the year, and are neither too poor nor too fat at any time. With some sheep, even when in this ideal condition for wool growing, irregularities and weaknesses in the fleece, such as dead yolk patches on the wither, open wasty patches, and the fault at present under discussion, are found. Some of the best constitutioned sheep show devil's grip; in fact, it is more prevalent in sheep with loose open shoulder blades than in the narrow sharp withered type.

Grip is mostly seen in old breeding ewes, and is more prevalent in some seasons than in others; particularly is this the case when there is a bad spring. It is possible for a sheep that is liberally fed on green succulent fodder to show no sign of grip externally on the fleece after being shorn; yet, if not so well treated off shears, to show it badly the following year. On the other hand, sheep that cannot be made to show it under any treatment are met with. It is least noticeable on fleshy, level, well-coupled sheep. The nearer the surface, and the more prominent the shoulder blades, the more it is seen, especially if the sheep are weak immediately behind the shoulder blades. Those having the loins running full and strong right into and level with the shoulder blades, are the least subject to it. Some sheep will cut fleshy chops right into the shoulder blades. Others cannot be cut within three or four inches; and it is just here (where the best quality of chops cannot be cut), that devil's grip is seen in the fleece.

But there are other factors. The movement of such shoulders in walking directs the yolk. Yolk always works into hollows, such as between folds, and this to a certain extent accounts for extra yolk accumulating. There is a depression, and in early summer, when the warmth causes the yolk to melt, it rises to the surface, and the dust collects and forms a black tip. Where the most yolk accumulates and rises to the surface, there the most dust will be collected and retained, thus showing the darker line.

It is between the higher level caused by prominent shoulder blades, and the lower level of the first rib, that the mark called devil's grip appears. With sheep in low condition, showing grip badly, a jelly-like secretion will be found under this spot. This variation of flesh is not the cause of the yolk being there, but it is the cause of the want of body and character in the wool immediately over it.

Extremely hot and dusty climates, and extremely cold and wet ones, will alter the outward colour of grip, but in bad cases the want of body and character in the wool are the same in either climate. Thin and wasty parts in the fleece, or unevenness of covering (not necessarily unevenness of fibre or variations in grade) are due to unevenness of flesh below it. Variations in grade, or coarser parts found in the fleece, are mostly due to the coarse flesh on which it grows.

MANGOLDS AS FEED FOR SHEEP.

H. W. Ham, Sheep Expert.

A correspondent asks "Why, in view of mangolds being so prolific and easily grown, they are not more used for sheep feed?" Most farmers find it necessary to raise lambs and mutton on such feed and in such a way as will give the best results for the least amount of time, labour and cash expended. Generally, the most suitable crops are found to be those into which sheep can be turned and allowed to feed themselves, no attention, other than occasional cleaning and turning off in very wet weather, being necessary. Fodder crops which can be put in with ordinary farm machinery, and on a fairly large scale, are best suited to the majority of farmers. Those crops which can be fed off, and will leave the land in better condition and ready for ploughing and early sowing are especially suitable. Still, there are very good patches which can be profitably used for mangold crops, and mangolds certainly yield a great weight per acre.

Mangolds alone are not particularly fattening, but when fed in conjunction with short oaten hay or oats, sheep, particularly the British breeds, do remarkably well. In the latter case, economical troughs and racks are necessary to prevent waste, and by this system aged, coarse crossbred ewes are fattened at the same time with their lambs. Mangolds are more suitable for feeding to dairy cows in late spring and autumn.

To get the best yield per acre from mangolds they must be sown in drills, thinned out, and worked between. This means, at times, hiring labour. Although heavy grain crops can be grown afterwards, the labour which has to be bestowed on mangold cultivation does not admit of any moderate sized area being available to sow for grain the following autumn. Mangolds need a strong soil, otherwise a liberal application of farmyard manure is necessary. Sheep cannot be turned in on mangolds and fed economically. They eat the crown out and the rain and dew cause decay. Hurdling off is necessary to make the most of them. This plan entails labour and attention, apart from the cost of the hurdles and maintenance. When the mangolds are eaten to the level of the ground they should be turned out with a fork. If forced to clean up deep rooting mangolds, sheep eat too much dirt to thrive well. The best mangolds for sheep are the Golden Monarch, Yellow Globe, and other varieties which grow on the surface of the ground. The sheep then get all without the farmer having the labour of turning them out.

Before mangolds are fed to sheep they should be out of the ground a few days and allowed to soften—a crushing with the heel of the boot will then suffice. The sheep, even if they are "gummies," will then eat them. There is no need for a slicing machine.. No injurious effects have resulted from feeding mangolds to ewes and lambs under natural conditions, but only a quantity sufficient for each day should be given. Mangolds which have been lying open to the frost and rain will, at times, bring about stoppage of water in wethers, and especially stall-fed merino rams if not allowed full exercise.

Sugar beet is very fattening, but tough, and cannot be eaten easily. If sliced, it goes black in a few hours, and, in that condition, is not readily eaten by sheep. Sugar beet is more suitable for pigs than for sheep.

STORAGE EXPERIMENT WITH MILDURA GRAPES.

F. de Castella, Government Viticulturist.

This experiment was the outcome of the request of the Mildura Shire Council of the 8th February last that an experimental shipment of half a ton or grapes be made to London, in order to test the practicability of disposing of surplus Gordo Blanco grapes by shipment in the fresh state.

Granulated cork was not at the time obtainable in Melbourne and a few days' delay was experienced in getting some cork ground up locally. During this time rain fell at Mildura and the Secretary of the Shire suggested that under the circumstances it would be better not to ship the grapes. The cases and cork dust having in the meantime been forwarded it seemed a pity that the expense already incurred should be to no purpose, and I suggested that the cases be filled with various varieties of grapes the keeping qualities of which could be tested by storing them for a couple of months in the Government Cool Stores. Mr. Grossmann secured the necessary grapes and attended to the packing and forwarding which were carefully carried out.

The grapes were sent from Mildura in two lots on the 19th and 22nd March respectively. On arrival at Melbourne they were stored in one of the chambers at the Government Cool Stores and kept at a temperature of 35 deg. F. On the 27th April, Mr. Grossmann being in town, I visited the Cool Stores with him and we inspected a few of the cases. They were then in fair order. We decided to leave them for another five or six weeks in cool storage in order to have a thorough test of the powers of resistance of the different varieties.

On the 17th June, in company with Messrs. R. Crowe and J. Knight, I again inspected these grapes. As a result of our examination, I submitted a report recommending that, as the bulk of the grapes were not marketable, they had better be utilized for a wine making experiment. This recommendation, which was endorsed by Mr. Knight, was approved and given effect to on the 21st, when the grapes were unpacked and crushed.

A very marked difference was noticeable in the condition of the different varieties. The following notes are submitted for the information of those interested in the question of grape shipment:—

The bulk of the grapes were of the Gordo Blanco variety and these stood the test far less satisfactorily than some others which were only represented by small quantities. The experiment was first suggested in order to test the possibility of profitably shipping Gordo Blancos. The other sorts were included for purposes of comparison. The following is a list of the cases showing the quantities and varieties stored. The cases were close bushel cases divided transversely by a partition. The grapes were packed in cork:—

	Cases.		Cases.
Gordo Blanco	8	Red Prince	1
Gordo Blanco (second crop) ...	1	Late red grape	1
Doradillo	2	Spanish Grape (supposed) ...	1
Waltham Cross	2	Red Malaga	½
Waltham Cross (second crop) ...	1	Ladies' Finger	½
Belas Blanc	2	White Crystal	½

In addition, there were four of Bradley's patent cases which provide abundant ventilation and in which the bunches are separated by veneer strips. These were filled as follows:—2 Gordo Blanco, 1 Waltham Cross, and 1 Red Malaga.

When finally unpacked the condition of each variety of grapes was noted as follows:—

Gordo Blanco.—Very poor order. Some cases were a little better than others, but taken as a whole they were a very poor lot. Less than half the berries were sound. The berries which were not manifestly bad (discoloured or mouldy) had nearly all softened at the point of attachment to the stalk. Few bunches could be lifted without numerous berries dropping off. The second crop Gordos were, on the whole, in better order than the main crop, probably owing to their having been less ripe when gathered. The Gordos in Bradley's cases were in much the same order as those in cork, so far as soundness is concerned. They were, however, much more wrinkled owing to loss of water by evaporation due to free ventilation. A curious feature was the almost complete disappearance of the characteristic Muscat flavour which fresh Gordos, and even the raisins made from them, possess in such a marked degree.

Doradillo.—This variety was in very much better order than the previous one. Though not attractive in appearance, chiefly owing to the dusty nature of the cork, fully 90 per cent. of the berries were not only eatable but very palatable; they adhered fairly well to the stalks which were wiry and not too brittle. Had the cork been of cleaner quality (free from dust) these grapes could have been marketed, and at this late season would probably have brought a fair price.

Waltham Cross.—These were in fair condition, though not equal to the Doradillo. The percentage of sound berries was about the same, but the ease with which they detached themselves from the stalk rendered very careful handling necessary and would prevent their being marketed. The second crop was better than the main crop, once more proving the need for picking on the unripe side. Those in Bradley's cases were equal to those in cork as regards soundness, but were a good deal wrinkled

Belas Blanc.—A late white grape which, from its firmness and similarity to the Spanish "Ohanez," made me hope it would store well. This grape proved disappointing. Berries fell off freely and the number of sound ones was not equal to that in the Waltham Cross cases.

Red Prince.—Only fair—not equal to Waltham Cross.

Late Red Grape. (Name unknown, said by some to be the Red Alicante.)—This grape, the berries of which are round, firm and crisp and of a handsome red colour, stood the test best of all. Fully 95 per cent. of the berries were sound; they adhered strongly to the stalks which were strong and wiry. These grapes were quite marketable.

Supposed Spanish Grape (Name unknown).—This oval white grape also stood the test very well, almost as well as the late red. Further experiments, in larger quantities, are recommended with these two varieties.

Red Malaga.—Only fair, about equal to Waltham Cross in cork. In Bradley's case not so good; many berries damaged from pressure at point of contact with case.

Ladies' Finger.—Poor condition, not much better than Gordo Blanco.

White Crystal.—Very poor condition, nearly half the berries discoloured or mouldy. The sound berries, however, were in good order and remarkably fresh.

The varieties experimented with may be classed in the following order, commencing with the best:—

1. Late Red Grape
2. Supposed Spanish Grape
3. Doradillo
4. Waltham Cross
5. Red Malaga
6. Red Prince
7. Belas Blanc
8. Ladies' Finger
9. White Crystal
10. Gordo Blanco.

Taking into consideration the poor quality of the cork dust obtainable and the fact that rain fell only a short time before the packing of the fruit, which *was all grown on irrigated land*, the results of the experiment are not wholly unsatisfactory. The following conclusions may be drawn from it:—

(1) Of the varieties tested, the Gordo Blanco was the least satisfactory. As grown at Mildura (irrigated), there is little hope of this grape being profitably shipped in the fresh state.

(2) Taking into consideration the very fair order in which a few of the varieties were found after three months' storage and in spite of the adverse conditions above referred to, the possibility of shipping fresh grapes on a large scale receives further confirmation.

(3) That the variety of grape is the most important factor in the problem. With the right sort of grape, properly grown and packed, there should be a great future for the export of grapes from Victoria in the fresh state.

* * * * * * *

The above is the substance of a report submitted to the Mildura Shire Council. The following additional notes on the experimental importation of fresh grapes from Spain will also be of interest to growers:—

The preponderating influence of the variety of grape on carrying power was very evident from the excellent order in which several lots of Spanish grapes of the Ohanez variety, imported from Almeria, Spain, by this Department, reached Melbourne last season.*

It was, in fact, the success of this experiment which led Mildura growers to hope that something might be done in the shipping of Gordo Blancos in the fresh state, and prompted the request of the Mildura Shire Council. Some particulars concerning the Spanish importations may therefore be here placed on record.

The experiment was made in order to test the question in a different manner than by making experimental shipments from this end—several of these had in the past only met with very qualified success. If, however, Spanish grapes could be landed in Melbourne in marketable condition it would logically follow that Australian grown grapes could be satisfactorily sent to Europe, provided conditions were the same as regards variety, cultivation, and packing.

Two lots of Spanish grapes (2 barrels each) were imported by the Department. These reached Melbourne respectively by the P. & O. s.s. *Morea* (early in January, 1909) and *Mooltan* (at the end of the same month). One barrel of each shipment was conveyed in cool storage and the other as ordinary cargo. These barrels were all purchased in London at Covent Garden Market at a price of 15s. 6d. each. They had therefore been picked for over a week before being transhipped at London. In addition to these, a barrel of the same grapes was shipped per R.M.S. *Mongolia* at the end of October, reaching Melbourne at the end of November, 1908. This barrel was forwarded by the Agent-General at the suggestion of a Melbourne correspondent. The grapes *ex Mongolia* and *ex Morea* were opened in the presence of a number of gentlemen interested in viticulture and in the fruit trade, at the Government Cool Stores on 8th December, 1908, and 21st January, 1909, respectively.

The condition of the fruit in each case was most satisfactory. A few berries in some of the bunches had deteriorated, but faulty berries were

* For particulars concerning the Almeria fresh grape industry, see *Journal* for September, 1903, p. 545.

only so inwardly; though the skin was discoloured it was intact, decomposition not having spread to adjacent berries of the bunch. The absence of moulds was remarkable. The number of faulty bunches would not amount to 10 per cent of the whole. If the damaged bunches were gone over and faulty berries removed the proportion of fruit unfit for use would be under 5 per cent. In only a couple of bunches in each barrel had decomposition affected many berries and even these still strongly adhered to the stalks—they had not fallen off or become juicy. The sound berries were as plump and fresh looking as though only just gathered. The stalks were dry and wiry, but the general appearance was excellent.

A striking feature was the very slight difference between the condition of those barrels shipped as ordinary cargo and those which were carried in the ship's cool chamber. The proportion of damaged fruit was the same in each and it was scarcely possible to discriminate between them. Cool storage was thus not necessary for the carriage of these grapes.

The *Mooltan* shipment was received in almost equally good order to the previous lots, though in this case there was a slight difference between the "cool chamber" barrel and the "ordinary cargo" one. This was naturally in favour of the former; being gathered late in the season these grapes had benefited more from cool storage than the former lots but the difference was only slight. The grapes were packed in thin oak barrels in coarse granulated cork free from dust. The following particulars concerning these barrels may prove of interest:—

Length of stave... ...	16½ in.	Weight of barrel ...	12 lbs.
Greatest diameter ...	15 ,,	Weight of cork	8¾ ,,
Gross weight full of grapes	60 lbs.	Nett weight of grapes ...	40 ,,

In South Australia recently I saw growing, under the name of Daira, a grape introduced from Almeria some years ago by Mr. T. Hardy, which, if not identical with the Ohanez, is very similar to it. A small box of grapes of this variety, packed in cork, was kindly sent to me by Mr. Quinn of the South Australian Department of Agriculture on the 26th April. These have remained in almost perfect order until now (5th July) though kept in this office at the ordinary temperature. Those interested in shipping grapes are referred to Bulletin No. 11, "A Valuable Grape for Export," by Mr. George Quinn, issued by the South Australian Department of Agriculture in 1906.

Successful shipments of this grape have been made from South Australia and also from Western Australia.

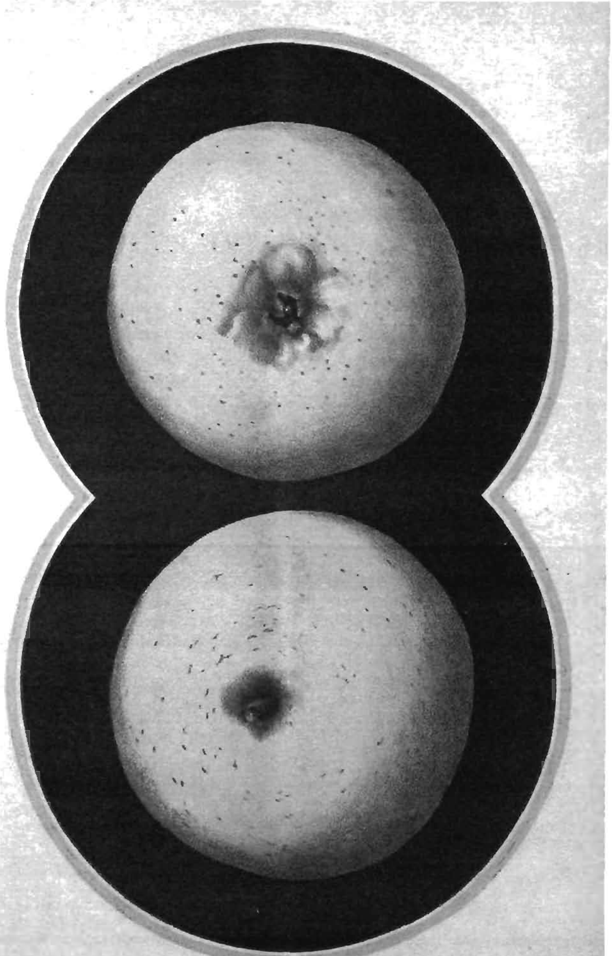
DESCRIPTION OF APPLE.

Dumelow's Seedling.

(SYN. WELLINGTON PIPPIN.)

J. Cronin, Principal, School of Horticulture, Burnley.

Fruit medium to large, roundish and flattened; eye large and open, set in a corrugated basin; stalk short, inserted in a narrow russet cavity; skin pale yellow, with a reddish, often bright red tint on exposed side; flesh yellowish white, firm, crisp, juicy; flavour tart, sub-acid, slightly aromatic. Quality, first class for culinary purposes, unsurpassed as a jelly apple. The tree is a fairly vigorous robust grower of moderately



DUMELOW'S SEEDLING.

spreading habit, the wood being covered with white spots, the leaves large and thick. It thrives in most of the apple-growing districts of the State.

Dumelow's Seedling has been exported to England since the inception of the trade, its good keeping qualities insuring safe carriage under fair conditions. It has always realized a price that is profitable, and is a favourite variety for shipping with many experienced exporters. The fruit is ready for shipment during March in the southern districts, earlier in the warmer portions of the State. It is also a valuable variety for exhibition, a dish of specimens of medium size and high colour scoring maximum points from capable judges, particularly in export sections where it is classed as one of the best six.

On account of its spreading habit of growth, Dumelow's Seedling is an easy apple to prune. By carrying the limbs in an oblique direction, and entirely removing the heavy laterals, it produces spurs along the branches from the base to the summit. On old trees, thinning the fruit spurs constitutes the greater part of the pruning. The fruit on young trees is usually large and gross, and should not be exported or stored as it is liable to be affected by "bitter pit." The fruit from mature trees will keep under fair treatment in handling and storing until October; in fact, it is recorded as being in good condition in the Burnley Gardens under the management of the late Mr. George Neilson on the 13th January of the following season.

It is liable to attacks of woolly aphis and black spot (*Fusicladium*), but is not a kind that the codlin moth favours. The trees at maturity bear heavy crops in alternate seasons. On the whole, Dumelow's Seedling is a fair apple, especially for export; but in all districts there are varieties which suit the local conditions and are more profitable, especially when marketed direct from the trees.

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Planting and pruning deciduous trees should be completed this month. If the work is deferred much longer it will clash with important operations of a differing character, and will also tend to prevent maximum results being obtained, even if proper means and methods are employed. In warm Northern districts, particularly, planting should be finished early to enable the young trees to become in a measure established before the hot weather sets in; it is also important that the trees generally should be pruned before active growth begins or a decided check may follow.

Pruning should be especially hastened where sucking insects infest the trees, so that a thorough spraying with a strong wash may be applied. It is perfectly safe to use oil emulsions before bud movement begins at a strength that will destroy any scales, red spider eggs, or aphides that may be present, while damage would be almost sure to follow a similar application a few days later. In some cases, the trees are sprayed first and then pruned, but such management cannot be termed economical and it is certainly unpleasant.

Pruning is one of the most important operations connected with the culture of fruit trees, and considerable space has been devoted to the

subject from time to time in the pages of this *Journal*. Readers are referred to Mr. Carmody's article, "Raising an Export Apple Orchard," which appeared in the number for July, 1908, for an exhaustive and illustrated explanation of the subject. For the purpose of these Notes it is sufficient to mention a few points of importance that are frequently overlooked.

It is generally accepted that the best possible design for any fruit tree is that which will enable the grower to easily work the soil near the trees with horse implements, to spray, thin, and pick the fruit without use of steps, &c., to force the tree to carry its crop on its strong branches where it is safe against ordinary winds, and where it is the least strain in every way on the energy of the tree. The first steps to secure such a tree are to plant only those with low formed heads, *i.e.*, with a trunk not more than eighteen inches long, and to cut back the branches severely until the desired form is obtained. A system of ten or twelve branches rising from the trunk at an angle of 45 degrees or thereabouts, and continued at that angle, with the branches well spaced and strong, and the weaker lateral shoots retained intact, especially in the lower portions of the tree, will provide a specimen capable of bearing at maturity six or eight cases of fine fruit with the least possible waste of energy.

Some common errors in design of trees, particularly pear trees, may be mentioned. A central system of strong straight branches is left, and, as a consequence, a horizontal or depressed and weakened series of branches are produced on the outside. The reverse is the correct method, and the more any tree, of any genus or species whatever, tends to produce strong upright shoots, the more necessary it becomes to begin at the beginning and to *force* the production of strong branches in an oblique direction on the outside, with an open or much weaker centre. In the latter case, the tendency is to the production of spurs and light laterals in the lower portions of the tree that will produce fruit regularly, and retain their vitality for many years; in the former it is certain that the lower parts will become barren on account of a rush of sap to the extreme points of the straight strong shoots, and, finally, the crop will be borne on the parts least able to bear a strain, above the reach and control of the grower, where winds have full effect, and farthest from the sap supply—the roots of the tree. It may not be out of place here to mention two books on pruning, written specially for the conditions obtaining in the temperate parts of Australia, one by Mr. G. Quinn, the other by Mr. W. J. Allen, and published by the Departments of Agriculture of South Australia and New South Wales respectively. They are the best, most reliable, and cheapest works on the subject, and should be in the possession of every orchardist and amateur fruit culturist.

Emulsions prepared from red oil and crude petroleum are the most popular and valuable washes against sucking insects on deciduous trees during the dormant season. When growth fairly commences in spring, and during summer, damage to the trees is likely to follow applications of such washes, but trees devoid of foliage may be safely treated if a proper mixture is made. The oil washes may be considered as a substitute for lime, sulphur, and salt wash, except in respect of the action of the latter as a fungicide, a point that is now scarcely worthy of consideration on account of the value of Bordeaux mixture for that purpose. The oils are more easily prepared, are cheaper, more pleasant to apply and handle, and not at all destructive to the parts of a spray-pump as is the lime, sulphur, and salt

wash, and are at least as effective. Oil wash is now used exclusively by many peach growers against peach aphis in late winter, and the trees are not at all damaged by its use.

The formula for preparing either red oil or crude petroleum emulsion is as follows:—Boil one lb. of soap, hard or soft, until dissolved in one gallon of soft water. Remove from fire and add two gallons of oil. Agitate thoroughly for a minute or so, and the mixture is ready for dilution. The use of lime as an emulsifier is recommended by many growers. The lime used must be freshly burned; one and a half pounds are placed in a tub and slaked with boiling water, one gallon of oil is added while the lime wash is hot, and stirred vigorously for a few minutes. The mixture is then diluted as required.

Crude petroleum, and red oil, are derived from the same source, the latter being a prepared article from the petroleum, the former more or less a residual oil left after the extraction of kerosene, benzine, red oil, &c. Red oil contains more oily matter, and accordingly spreads better. It is effective at a strength, or dilution of one part oil to fifteen parts water. In the case of San Jose scale it is by far the best insecticide yet employed in Victoria. Crude petroleum is varying in quality. Complaints have been made that an undue amount of resin has been found in samples analyzed. A fair grade sample is a good insecticide against mussel scale, woolly aphis, red spider mite (Bryobia), &c., used at a strength of one in ten. It should be remembered that only a thorough application, striking and covering all affected parts, is likely to be effective, and that these washes are safe only when the trees are without leaves or blossoms.

There are various proprietary preparations that are effective against sucking insects. These are usually mixed ready for dilution as directed, and are handy, and being fairly cheap are to be recommended for use by gardeners with a few trees only. "Scalecide" is a new miscible oil preparation that is thoroughly effective. "Salva Fruta," a potash wash, is also good, and "Soaperine," a well known Victorian preparation, is one of the best aphicides.

SHERRY: ITS MAKING AND REARING.

F. de Castella, Government Viticulturist.

(Continued from page 446.)

CHANGES OF FASHION IN SHERRY.

Since Shakespearian times sherry has undergone very radical changes, and Falstaff would, no doubt, fail to recognize in a high class modern sherry the sack he so frequently called for. In those remote times "sherris sack" was a dark-coloured, rather bitter wine, similar to the brown Malaga, which is still being made in the neighbouring seaport, and probably identical with the *Vino de Color*, which is still made in Jerez for special purposes, as we shall see later. This class of wine was superseded by a more natural one, free, or almost free, from boiled must, arrope, or "Color," though slightly, and sometimes even distinctly sweet—the after-dinner, or, as they were often called, East India sherries, of the middle of the last century. More recently yet a further change of fashion is to be recorded—a change in favour of a still more natural wine.

usually known as the Fino type; so that at the present day the sherry in greatest request is absolutely different to what it was 100 years, or even 40 years ago.

Even at the present day the majority of the wines required by the trade, and with which one usually meets with in hotels, are very different from what one is given to taste in the bodegas. Sherry is in its natural state a dry wine—a fruity sherry is quite an exception, and yet the usual sherry, such as we know it outside of Spain, is more or less fruity, often quite distinctly so. In the bodegas, on the other hand, one is struck by the extreme dryness of the wines, which in some cases even amounts to bitterness. Some of the oldest and most valuable wines often strike a person tasting them for the first time as distinctly and unpleasantly bitter. This peculiarity grows on one, however, and, after a while, no longer shocks the palate, but is appreciated, for it is often the finest and oldest wines which have by long storage in wood acquired this character.

Sherry a Blended Wine.

This apparent contradiction is explained by the fact that the sherry of commerce is nearly always a blended wine. The elements which go to make up the blend are invariably sound, pure, natural wines, thoroughly well matured, but of quite distinct types. It is seldom that an unblended wine is shipped, though a limited number of special customers who have acquired a taste for a particular type may send orders for this wine without admixture.

As has been stated, the majority of wines of Jerez are absolutely dry. Besides blending to combine the different qualities required by the trade, the wine is nearly always rendered more or less fruity by the addition of a small proportion of sweet wine. In the case of the highest grade this is added in the shape of the costly Pedro Ximenes, or Paxarete, whilst for more ordinary qualities a sweet white, made by stopping fermentation with spirit, known as "*Dolce Apagado*" (sweet quenched), or of still sweeter "*Mistela*," is used. Such wines are made in considerable quantities for the sweetening, before shipment, of the cheaper grades of sherries.

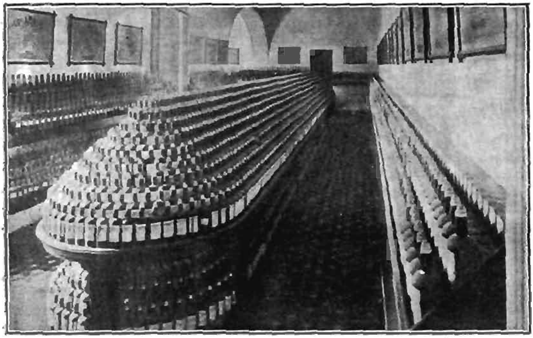
The blending of wines before shipment is an operation calling for skilful management on the part of the merchant. It is one of their principal preoccupations to maintain an even standard and to be able to execute repeat orders to the satisfaction of their customers. Complaints are frequent as to the demands of the trade; individual customers are becoming more and more difficult to satisfy, each one requiring his own particular blend, so that nearly every customer requires a different wine. Thus it is that the sample room is an important feature of all the larger bodegas. In these rooms one sees thousands of bottles, each of which is a sample corresponding to an order which has been forwarded by the establishment. With the aid of these and reference to the book in which a record of each blend is kept repeat orders are possible, but a considerable amount of work, thought, and tasting is entailed. A photograph of the sample room of Messrs. Pedro Domecq, the well known sherry shippers, is here reproduced.

Principal Types of Sherry.

The variety of wines a visitor is shown at any of the large bodegas is almost bewildering. His first impression is one of hopelessness of ever correctly grouping the different wines he has seen or of arriving at a correct classification of sherries generally. He begins to realize how little

the average man—even the man who has a fair general knowledge of wine—really knows about sherry. To form a correct idea with the wines before one was difficult enough. To endeavour, by description alone, to convey a correct idea of such a complex question, and without samples to assist the memory by means of the palate, is harder still.

Before attempting to describe the different pure types, reference must be made to the characteristic taste of sherry and the organism by which it is produced. The sherry taste is almost too well known for it to be necessary to attempt to describe it. That curious taste, reminding somewhat of ether or, to be more correct, of aldehyde, which distinguishes sherry from all other wines, and which has, so far, altogether eluded us in Australia. Though we have achieved a considerable measure of success in the making of wines of other types, in the direction of sherry we have not yet turned out any wine which even a moderate wine judge would for a moment mistake for a genuine sherry. This taste is not present in all the wines one meets with in Jerez. In some—as we shall see presently—it is con-



SAMPLE ROOM OF BODEGAS OF "PEDRO DOMECQ."

spicuous by its absence, but some wine, which possesses it in a pronounced form, is almost always blended into the sherries of commerce before shipment, so that this peculiar taste is characteristic of all sherries one usually meets with.

Sherries in their natural unblended state can, in fact, be all divided into two great groups, viz., those with this peculiar character and those without it. This will be more readily understood when the agency by which the development of this character is brought about has been explained. All wines possessing this sherry taste have, during their first few years, been stored in ullaged casks, in which a film of a special type of fungus has been allowed to freely develop on the surface. It is the development of this fungus which is entirely responsible for the production of the sherry taste. This fungus, which is known in Spanish as *flor* (flower), is, in appearance at least, identical with ordinary "flowers of wine," or *mycoderma vini*, with which cellarmen are only too familiar, and which, in the case of light dry wines, is rightly looked upon as evidence

of faulty cellar management. In the case of sherry, however, the growth of *flor* is encouraged and regulated. The means by which this is done will be considered later; at the present stage we shall confine ourselves to the fact that *the development of what we may call the sherry taste is entirely due to the growth of this fungus film*, and proceed to define the terms by which the leading types of unblended sherries are known in the bodegas of Jerez.

According to whether *flor* has been present or absent, we may divide all sherries into two great subdivisions. If the alcoholic strength of the wine is under 25½ per cent. of proof spirit the growth of *flor* is possible, and the sherry taste develops. If, however, the alcoholic strength is over 27 per cent. the growth of *flor* is no longer possible, and no such development takes place.

We can thus divide all sherries into two main divisions, represented by the following wines:—

1st. *Fino Type.*—A wine which in its early years was reared with a film of *flor* on its surface, and possesses a pronounced ether taste and bouquet. This particular character is often described in Victoria by the term *Manzanilla;* a not very appropriate word, as it should be confined to the rather light wines of a well-defined portion of the district.

2nd. *Oloroso Type.*—A wine, which from the completion of its first fermentation, has contained too much alcohol for the growth of *flor* on its surface, and from which the characteristic ether taste is absent.

Fino Sherries.

Each of these two groups includes several distinct wines. *Manzanilla*, for example, belongs to the fino class. As this term has been often used in Australia, and not always quite appropriately, it will be well to here describe its true meaning. Manzanilla is the name given to the wine grown in the neighbourhood of San Lucar de Barrameda, which town is situated 18 miles north-west from Jerez. Here the soil is sandy, and for this reason these wines are lighter, both as regards alcoholic strength and body, than true sherries, but they possess the characteristic sherry taste in a very high degree.

The making of wines of the fino type is a comparatively recent introduction to Jerez, and is the outcome of the gradual change in taste in sherry in England. Sixty years ago Jerez only produced wines of the oloroso and allied types. The solera system of maturation, which will be described in detail later, and without which the methodical utilization of the *flor* fungus would scarcely be possible, had not then been introduced, though it had been in use since very remote times at San Lucar, and also at Montilla, about 100 miles away to the north-east. A manzanilla is thus essentially a fino type, but being a special variety of it, the shorter and more comprehensive term can more aptly be used to describe wines of sherry character.*

Amontillado is a term familiar to any one who has the slightest knowledge of sherry, and yet the exact meaning of the word is not generally understood. It must be considered in connexion with the fino group, though it is rather a distinct type, for all amontillados have commenced by being finos. An amontillado is nothing less than a very old fino which has entered on a second stage of its development.

* How the word *Manzanilla* came to be used to describe this particular wine is not clear. Literally it means chamomile, and also a little apple, neither of which meanings conveys much information. The bitter taste of chamomile can scarcely be implied, for other sorts of sherry are distinctly more bitter than the wine of San Lucar. There is a small town, 40 miles north of San Lucar, called Manzanilla, but it does not appear to have anything to do with the naming of this wine.

A remarkable feature of sherry generally is that it is a wine which can be almost indefinitely stored in wood. Unlike most other wines, which should be bottled as soon as their maturation in the cask has reached a certain stage, sherry undergoes a continuous evolution when stored in wood—an evolution which may be divided into several distinct stages. *Amontillado is the second stage in the development of wines of the fino type.* The term is derived from the name of the town of Montilla, which has already been referred to, and means literally "like Montilla," a term which came into use many years ago, when the development of fino wines was an innovation in Jerez, and something was required to distinguish them from the old fashioned brown sherries and wines of the oloroso and allied types.

The transformations which occur during the evolution of sherries are most interesting; one of the strangest is the gradual increase in the alcoholic strength of the wine, which is the result of the curious conditions prevailing in the bodegas in which it is stored—abundant ventilation—a dry atmosphere, and a fairly high temperature *—not only the strength, but also the colour, undergoes change becoming gradually darker, at first very slowly, but afterwards more rapidly. Exceedingly old wines are of a deep brown colour.

After a time the strength of the wine in a fino "solera" will have increased to such an extent that *flor* can no longer live on its surface. The wine continues to develop, however, but no longer on the same lines. It has entered the second stage of its evolution and is becoming *amontillado*. The exact age at which this change takes place is variable, depending on the individuality of the wine. The transformation is gradual; for some years the characteristic "ether" taste of the fino is retained, but it eventually gives place to a curious "bite," or sharpness, akin to bitterness, difficult to define, but well known to connoisseurs of sherry. It takes from twelve to twenty years, from vintage, before a wine can become amontillado. At first it is an amontillado fino, but as the length of time since the disappearance of *flor* increases, so does the fino character also disappear, until the wine has reached the complete amontillado character when it is said to be a *vino hecho*,† or made wine.

Even after this, evolution continues, but again on different lines, for the wine enters on its third, or final stage. This is a rather less distinct transformation than the former one, nor is it distinguished by any particular name. The result is simply said to be a *vino viejo* (old wine). It has by this time become stronger in alcohol, darker in colour, and usually distinctly bitter.

A curious fact is the similarity which exists between the wine at this stage, and an old oloroso of similar age, a similarity which is in striking contrast to the marked difference which existed between them at an earlier period of their contemporary history. In their youth the fino taste, due to the growth of *flor*, separated them absolutely; with the disappearance of this flavour from one of them, in their old age, they become a good deal more similar to one another.

All finos, however, do not develop absolutely on these lines. It is only finos possessing sufficient body which will make good amontillados, and which are worth keeping for the long series of years the change demands. Thin wines, such as the manzanillas of San Lucar, are not worth

**I had at first some difficulty in crediting that this increase in strength really took place.* It is not in accordance with the experience of most cellarmen in Victoria. On enquiry, the correctness of the *contention was proved to me in various ways.* The question will be dealt with in detail later.

† Hecho is the past participle of the verb hacer, to do or make.

keeping so long; they mature far earlier, however, and on account of their pronounced fino character are much used for blending nowadays.

To recapitulate, amontillados, including the final stage of vino hecho and the subsequent one known as vino viejo, are merely older forms of the fino class.

OLOROSO SHERRIES.

If the alcoholic strength of the wine be 27 per cent. of proof spirit, or over, the life of *flor* on the surface is not possible, and the wine will develop on entirely different lines, forming a class quite distinct from what we are usually accustomed to look on as sherry. The best of these constitute what is known as the "oloroso" type; though several terms are employed to designate different grades, the word may, for the sake of simplicity, be applied to the whole group of natural wines which have developed in the absence of *flor*. These are full-bodied, unctuous, full-flavoured wines, yet quite dry, for it is rare even for this type to contain more than a trace of unfermented sugar. These wines remind the novice somewhat of a dry Madeira rather than a conventional sherry; but the resemblance must not be mentioned to a Jerez wine man, who considers Madeira far inferior to his own. The best wine judges of Jerez consider the olorosos to be the chief glory of their privileged district. This strikes the visitor as curious, for he at once misses the characteristic ether (or, more correctly, aldehyde) taste. When old, olorosos are brown in colour, and often somewhat bitter. The older they get the more bitter and darker do they become. I have tasted exceedingly old olorosos, still in ullaged butts, as brown as stout or porter, which had become so bitter as to be unpleasant. These wines are of very high value, but are used exclusively for blending, a small proportion giving remarkable character and quality to a blend.

The East India sherry of our fathers and other brown sherries, depend chiefly on wine of the oloroso type for their body and roundness; they, as well as most after-dinner sherries, are usually more or less sweetened before shipment by an addition of Pedro Ximenes or Paxarete, which conceals bitterness and softens the wine. Olorosos are said by several authorities to owe their character to a relatively large proportion of higher fatty acids, such as butyric, lactic, caprylic, &c.; the ethers these acids give rise to being responsible for the character of the wine. It is said that this character is largely due to the apiculatus yeast; this species is credited with having much to do with the fermentation of these wines, which is not brought about exclusively by the ellipsoideus yeast, responsible for the fermentation of most other wines, as well as for those of the fino class at Jerez. An interesting field for research is here presented, which will, no doubt, receive attention in the recently established *granja*, or Government experimental station, where a fine laboratory was in course of erection at the time of my visit.

In a general way it will suffice to remember that olorosos are wines which, owing to their higher alcoholic strength, have never had *flor* on their surface. Once this fundamental difference between finos and olorosos is thoroughly grasped, the understanding of the complicated sherry question is greatly simplified.

Our inability to produce wines at all resembling the fino type is also explained. Our so-called Australian sherries are almost always fortified when quite young, an operation which, by rendering impossible the growth of *flor*, absolutely prevents development on *fino* lines.

(To be continued.)

Other Types of Sherry.

So far only natural wines have been dealt with; that is, wines either altogether unfortified or only very slightly so, the characteristic flavours of which are due to natural evolutions under careful cellar management, according to the solera system, peculiar to the district. Other types exist, however, mostly fortified wines, which are occasionally used for blending purposes. Chief amongst these are *Vino de Color*, *Pedro Ximenes*, and *Paxarete*, which are the only ones used in the blending of sherry. Excellent Muscats are also made in the district, chiefly in the neighbourhood of Chippiona and Chiclana. The Tintilla of Rota, better known to us as Rota Tent, and at one time largely shipped to England as communion wine, is consumed as such, and does not enter into the composition of the sherry of commerce.

Vino de Color.—This is quite different to any wine we know in Australia, but a description of the types of sherry would be incomplete without it. It is, in fact, a relic of the past, being identical with the wine shipped to England in Shakespeare's time under the name of sherris sack. Such a wine is closely akin to that which is made at the present day at Malaga, and largely shipped to France, under the name of Malaga de Color, or Brown Malaga. Such a wine is made by mixing with one portion of the wine, either during or before its fermentation, a certain quantity of *arrope*, a thick treacly syrup, obtained by boiling down another portion of the must to the required degree of concentration (about one-third to one-fifth of its original bulk). After a long, slow fermentation, during which almost the whole of the sugar is converted into alcohol, one obtains a wine of about the same colour as porter or stout, only slightly sweet, distinctly bitter, and mainly characterised by its curious cooked, almost burnt, flavour. Such a wine is certainly an acquired taste, but it has its fanciers, even at the present day. It is said to be a great pick-me-up—Falstaff certainly had a very high opinion of it. When well made and very old it develops a curious indescribable flavour and bouquet, which renders it very valuable for blending, and enables it to command a high price. Very old "*Color*" is a valuable wine, which is to be found in every bodega. It enters into the composition of nearly all brown sherries, giving them their colour. Although, with age, the heaviest sherries become dark in colour, it is only in exceptional cases that the change is due to natural causes; in all but exceedingly high-priced wines, Vino de Color is the colouring agent used. Of recent years large quantities of brown sherry are forwarded annually to Scotland to be blended in with whiskies; these often owe their colour to this particular type of wine.

Pedro Ximenes is the exceedingly sweet wine made from the grape of the same name,* partially dried on esparto mats in the sun before being crushed. The very high gravity must, thus obtained, ferments slowly, and produces a wine which is almost a syrup, and very fragrant.. It is the wine chiefly used for giving dry sherries the slight amount of fruitiness required by the trade, and is a wine which, owing to the small yield per acre, is costly to produce. An old Pedro Ximenes commands a high price. Though too sweet for the majority of consumers as a wine, it finds a few fanciers, and there is a limited sale for it in bottle in Jerez, where it is sometimes served in small glasses as a liqueur. Pedro Ximenes is essentially a blending wine.

* The true Pedro Ximenes of Southern Spain is a totally distinct variety from the variety we know as Pedro in the Rutherglen and other districts of Victoria.

Paxarete is another form of sweet wine made from the Pedro Ximenes grape, and called after a small town near Arcos. Since the destruction of the vineyards of Paxarete by the phylloxera, the old type of this wine is almost a thing of the past. It differed a good deal from the Pedro Ximenes, chiefly in the way it was made, portion of the must being concentrated by artificial heat.

Though Paxarete is still obtainable in the bodegas of Jerez, it is at the present day chiefly a made-up wine, or blend of Pedro Ximenes, and sometimes even "Dolce Apagado," with a certain quantity of Vino de Color. Modern Paxarete is not to be compared with the wine that made its place of production famous in olden days. Paxarete was largely used in the production of brown sherries. Its place in such blends is now largely taken by the sweet wines and "*Color*" by which its imitation is made up.

Dolce Apagado and Mistela are sweet whites of ordinary type, made by stopping fermentation with spirit in the usual way.

* * * * * *

Such are the main types of wine one meets with in Jerez. The great majority of them are very different from what one is accustomed to get as sherry, outside of Spain. It is by blending wines of the fino, amontillado, and oloroso types, especially the first-named, with a little Pedro Ximenes, or other sweet wine, that the high class sherries of commerce are turned out. These are all high class wines, matured on the solera system, which, as we shall see later, considerably increases the cost of production. Such wines can only be sold at a profit at a fairly high price, probably not less than £50 per butt. Many cheaper sherries are to be found on the market. These are blends of varying proportions, according to price, of the above wines and of wines from the neighbouring provinces of Huelva, Sevilla, and even La Mancha; but the highest priced sherries are exclusively grown, matured, and handled near Jerez. They are almost invariably blended and slightly sweetened before shipment, and usually fortified also. The increase in alcoholic strength suits the English palate, and insures the wine keeping its condition.

The Factors of Sherry.

The Soils and Climate of Jerez have already been dealt with (see *Journal*). To briefly recapitulate, the geological formation is of tertiary age and the soil chiefly remarkable for its high lime contents. The white marls of the Afuera or Albariza type, containing in some cases as much as 80 per cent. of carbonate of lime, are the most characteristic ones and those which produce the most valuable wines.

Near the town of Jerez one also meets with "Barros" or clay soils and "Arenas" or sands, whilst at San Lucar de Barrameda, the home of Manzanilla, at the mouth of the Guadalquivir, the vines are grown on sandy soil. Nearly all these soils are rich in lime, the abundance of which element is one of the striking features of the sherry soils.

The climate of Jerez is one of the warmest in Spain. As far as temperature and rainfall are concerned, it reminds one a good deal of northern Victoria, with the difference that, being only some 20 miles from the sea, the air is not so dry.

Varieties Cultivated.

Sherry differs from Port in being practically a "one variety" wine, nine-tenths of the best vineyards being planted with one variety of grape, viz., the *Palomino* or *Listan*, for it is known by both names. This vine reminds

one strongly of the one we know as Sweetwater, by its leaves, fruit and habit of growth; like the latter sort, it is an early ripener. The similarity of the two was mentioned many years ago by Dr. Kelly in his works on the Vine in South Australia, and again by Mr. Thomas Hardy, of Adelaide.* The identity or otherwise of these two vines will shortly be settled as authentic specimens of the *Palomino* variety were imported into Victoria by the writer last year. That the English Sweetwater should be of Spanish origin is by no means unlikely, seeing the large trade which has flourished for centuries between Cadiz and England. Any one introducing cuttings into a cold country would naturally select the early ripening Palomino.

Pedro Ximenes, though often to be met with in the vineyards, is not nearly so important a constituent of Sherry as is usually stated in books on wine. This variety is mostly made into the syrupy wine of the same name, used to sweeten the sherries of commerce before shipment. Though very extensively grown in the districts of Malaga, Huelva and Seville, and to some extent also at Montilla, it is not so plentiful at Jerez, though some authorities consider its admixture, in small proportion, with the Palomino to be an improvement. It is said in some quarters to be none other than the Riesling of the Rhine which, over a century ago, was introduced into Andalucia by one Peter Siemen, whose name in Spanish was corrupted into Pedro Ximenes. Though picturesque, this story cannot be true, for this vine is absolutely different from the Riesling.

Such varieties as *Mantuo de Pila* and *Mantuo Castellano*, *Cano Cazo*, *Perruno*, *Beba*, *Calon*, and *Uva de Rey*, are also to be met with, but usually in smaller proportion. The "Mantuos" are later grapes, chiefly grown in the sand soils, where they produce wines worth up to £25 per butt. In some parts of the district, chiefly near Chippiona, some muscats are grown; from these is made a very luscious *Moscatel* wine. Muscats are never, by any means, mixed with the grapes used for making sherry.

VINTAGE.

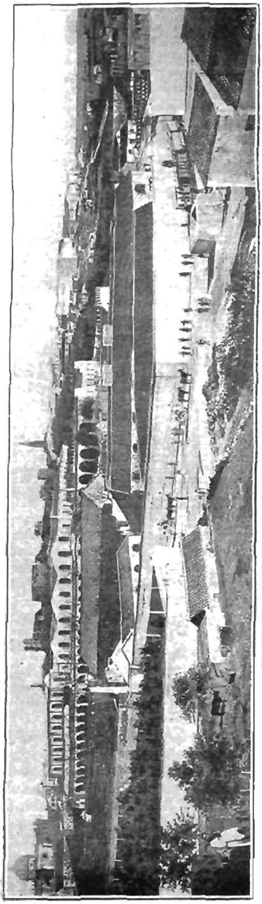
This takes place about the end of September, or beginning of October, when the grapes have attained complete maturity, but before they are over ripe. For the lighter Manzanillas, they are picked somewhat earlier; hence it is that vintage is usually concluded at San Lucar before it has commenced at Jerez. As a result of the change of fashion from the fuller "after dinner" wines of former days in favour of "Fino" sherries, vintage at Jerez commences rather earlier now than it did twenty or thirty years ago.

Judging from the strengths of the young wines which I saw, the gravity of the musts would vary between 13 deg. and 16 deg. Beaumé (1.100 and 1.125 s.g.). For wines of the fino type, 14 deg. and 15 deg. would be most usual. This will give some idea of the state of maturity.

The grapes are carefully gathered into small wooden boxes fitted with handles. Sometimes the vines are gone over twice, in order to insure that only thoroughly ripe grapes are brought in. In these boxes, known as *tinetas*, the fruit is conveyed to the casa de lagares or crushing house,† where the extraction of the juice is carried out. A photograph is reproduced of that at Obregon, the property of Don Francisco Ivison y O'Neale, one of the best vineyards of the district, which is typical of the majority

* See *Notes on Vineyards in America and Europe*, p. 67.

† Large vineyards are not the rule in the Jerez district. The most profitable size is said to be between 50 and 100 acres. This can be managed by a capataz (working overseer) with a gang of men under him more satisfactorily than those of larger or smaller size.



GENERAL VIEW OF BODEGAS OF GONZALEZ, BYASS AND CO.

of them. It shows the heavy stone arches which always constitute the central portion of the façade, giving it a characteristic appearance.

Alongside of the casa is a large open level space, known as an *almijar*, where the grapes are exposed to the sun on esparto grass mats. The fruit is carefully spread on these mats, with as little crushing as possible, and left in the sun for a varying time. The mats are made by sewing a long strip of esparta matting into a spiral or requisite size, usually about 3 feet in diameter. The object of this insolation is to allow any dew or moisture to be dried off; it is not usually of sufficient duration for much concentration of the must to take place. The length of time the grapes remain on the almijar varies greatly with the type of wine it is intended to produce. For the fino type, now so much in vogue, a short exposure of usually only a few hours is sufficient; for heavier olorosos, a couple of days may be judged necessary; whilst, for the luscious Pedro Ximenes and Moscatels, nearly a fortnight may be the length of exposure—for these wines the grapes are reduced to a semi-raisin state before they are made into wine. *When grapes are sold, in which* case they are conveyed to the crushing house on pack mules, they have, before being placed in the baskets, already undergone the necessary sun ripening. They are always carefully handled and broken as little as possible prior to their exposure to the sun.

The treatment they receive in the crushing house is very different from what the colour and character of the finished wine might lead one to expect. I believe it is commonly thought in Australia that sherry is *fermented in its skins—something* after the manner of Port, for example. Nothing could be further from the truth; one of the most striking features in the making of this wine is the rapidity with which the juice is separated from the marc and the avoidance of further contact with the latter, as

soon as the grapes have once been crushed. Sherry in its youth is a light delicate wine, totally different to the finished article. The greatest fault in a young wine is coarseness, and one which for high-class sherries must be avoided at any cost; a wine which has any tendency towards coarseness is said to be *Basto*, and never finds its way into the better class wines. It is, in fact, usually sent to the still. Distillation is the fate of all inferior wines, the so-called "Cognac Jerezano" enjoying great popularity and meeting with a ready sale throughout Spain. The greatest care is taken to avoid coarseness, and one of the main means to this end is the rapid separation of the juice from the marc. So much is this so, that in former days it was customary to separate the grapes from the stalks over wide-meshed riddles before crushing and pressing. This, however, is not so generally practised nowadays.

INTERIOR OF PORTION OF BODEGAS OF GONZALEZ, BYASS AND CO.

The crushed grapes receive very little pressing, in order to produce the first quality wine. Our photograph gives a view of some of the lagares or wine presses at the Obregon vineyard. The most striking feature of these is the lightness of the central screw, which is quite incapable of applying powerful pressure.

The making of the wine is practically as follows:—Enough grapes are emptied on to each lagar to yield 1 butt (108 gals.) of juice. These are crushed by being trampled on by men wearing heavy shoes of a special make. The juice flowing from this crushing is carefully strained before being filled into the butt. During crushing the grapes are dusted over with a certain quantity of "yeso," which is Spanish for gypsum or plaster (sulphate of lime), the addition of which is one of the important features in the making of this wine and one which will be dealt with in detail presently.

When thoroughly crushed, the grapes are heaped round the central screw and pressure is applied. In lieu of the cage of our presses, the heap is kept in shape by means of a long strip of esparto matting held

in place by two wooden pegs. One of these is first stuck well into the base of the heap of crushed grapes; the attached strip is then wound spirally several times round and fixed by means of the second peg in the upper part of the heap. It is easy to understand that after such treatment a large percentage of juice still remains in the marc. It is, however, only the produce of this first pressing which is used for the making of high-class wine.

CASA DE LAGARES AT OBREGON

The quantity of grapes put on to each lagar is usually sufficient to yield 1 butt of first quality juice. This rapid and not very complete pressing is carefully carried out in order to obtain a delicate clean wine free from excess of tannin, which seems to interfere with the satisfactory growth of the "flor" fungus at a later stage. The capataz, or vineyard overseer, in his zeal to show good returns sometimes urges the workmen to press rather too hard, and thus is unwittingly responsible for an odd butt becoming coarse or basto.

LAGARES, OR PRESSES, AT OBREGON.

After this first pressing the juice still retained by the marc is extracted by a more powerful screw press, and sometimes a further extraction of juice is obtained by means of hydraulic presses, the marc being filled into esparto grass bags similar to those used in the pressing of oil from olives. The results of these latter pressings are never mixed with the first

wine; they are used for the distillation of brandy and for consumption by workmen on the vineyards.

The good wine is filled into butts and immediately conveyed to the large bodegas of the merchants in the town of Jerez. It is rare nowadays for fermentation to take place at the *casa de lagares*. The butt is placed on a waggon and taken into town. To guard against loss by overflowing at the bung, owing to fermentation, which usually commences before removal, a funnel is inserted in the open bung-hole, in which the froth can rise whilst the liquid portion finds it way back into the cask.

THE USE OF YESO OR PLASTER.

The plastering of the grapes or addition of gypsum or sulphate of lime prior to their being crushed has already been referred to. It is of sufficient importance to merit detailed consideration, for it opens up a question which has given rise to much discussion in wine-growing countries of recent years, and which has been regulated by the Pure Wine Acts of most of them.

This addition is by no means peculiar to Jerez. It was common, especially in warmer countries, where it was very freely used, until a limit was placed on the quantity which could legally be added. This has gradually led to its almost compete disuse in France and several other countries.

The object of plastering is to insure making a sound wine under conditions more or less unfavorable to normal fermentation. It has long been known that fermentation in presence of sulphate of lime is far less liable to give trouble than without it, and especially in hot climates its use has been customary since the very earliest times.

According to Dr. Armand Gautier, one of the leading viticultural and medical authorities of France—

"The effects of plastering are multiple. It appreciably hastens the cleansing (depouillement and clarification of wine and thus partly opposes itself to the action of disease germs. It helps to dissolve certain colouring matters . . . as well as a certain proportion of salts of weak organi acids. . . . At the same time, the plaster acts upon the cream of tartar, from which it removes one-half of its tartaric acid, in the shape of neutral tartrate of lime, which precipitates, whilst acid sulphate of potash is dissolved in place of the cream of tartar."

He quotes the formula given by Bussy and Buignet as follows:—

Cream of tartar.	Sulphate of lime.	Tartrate of lime.	Acid sulphate of potash.	Cream of tartar.

$$2\,(KHC_4\,H_4\,O_6) + Ca\,SO_4 = Ca\,C_4\,H_4\,O_6 + KHSO_4 + KHC_4\,H_4\,O_6$$

In a foot-note he also gives M. Magnier's formula:—

Cream of tartar.	Sulphate of lime.	Tartrate of lime.	Neutral sulphate of potash.	Cream of tartar.

$$2\,(KHC_4\,H_4\,O_6) + CaSO_4 = Ca\,C_4\,H_4\,O_6 + K_2\,SO_4 + C_4\,H_6\,O_6$$

which he, however, considers to be only the first stage in the reaction,

"The final result of which is always according to MM. Bussy and Buignet's formula."

He concludes by approving of the action of the French War Department in fixing the limit of the contents of sulphate of potash in wines purchased for the French Army at 2 grammes per litre. This limit was eventually adopted throughout the country, a lead which has since been followed by most other countries. It is the limit fixed by our own Pure Wine Act.

M. Marty in a report to the French Government sums up the advantages of the use of plaster very concisely as follows:—*

"The addition of plaster to the grapes renders fermentation more rapid *and more complete; it prevents or renders more difficult, subsequent fermentations;* it raises the acidity of the wine, whence a more intense and more brilliant (vermeille) colour; it cleanses (depouille) and clarifies the wine and renders it more marketable; it facilitates its conservation. . . . Thanks to their clarification and higher acidity plastered wines resist better to alterations known under the name of *diseases of wine; they support better heat, transport, manipulation and blending.*"

The restriction of the use of plaster in southern France gave great trouble to wine-makers, and was at first responsible for the making of much faulty wine, until such time as other means were found of controlling fermentation. The question of the influence of a certain proportion of sulphate or bisulphate of potash in the wine, on the health of the consumer, is foreign to the present report, but it is worthy of note that many eminent men were against the limit being fixed at 2 grammes per litre. Some claimed that the salt was quite inoffensive—certainly far more so than the products of faulty fermentation which the use of plaster insures the absence of.

In the case of sherry, plastering seems to be necessary, in order to obtain the maximum of quality—without it, the complicated evolution of the wine during the process of rearing in soleras, does not seem to take place satisfactorily. In an unplastered wine the growth of the flor film, which has so much to do with the character of most sherries, is less regular. In fact, the best authorities hold that without plaster in larger quantities than is permitted under our Act, it is not possible to turn out high-class sherries.

The Spanish Pure Wine Act allows the use of a larger quantity of plaster in the case of sherry than in that of other wines; a rational course, for it seems scarcely logical to retain the same limit for a sherry, of which one does not drink more than one or two small glasses, as for a light vin ordinaire, of which one consumes several times the quantity.

The quanity of plaster used in the vintage at Jerez naturally varies somewhat—in a general way it is from two to three times as much as is allowed by our Act. It thus follows that sherries usually contain from 4 to 6 grammes of sulphate of potash per litre, rarely more. Admitting that the wine contained naturally 5 grms. of sulphate per litre, a liberal estimate, and that 156 grms. per hectolitre (22 gallons) will lead to the presence of 2 grms. per litre, it would be necessary to supplement this by the addition of 273 grms. of sulphate of lime, in order to bring the sulphate of potash contents to 4 grms. per litre; or 429 grms. to bring it to 6 grms. per litre. If the grapes yielded wine at the rate of 130 gallons to the ton, this would mean respectively the use of $3\frac{3}{4}$ lbs. per ton of grapes to bring it to 4, and nearly 6 lbs. per ton to bring it to 6 grms. per litre. As plaster is rarely pure sulphate of lime, allowance must be made for impurities by adding from 15 to 20 per cent. more than the above quantities.

The plaster, which is burnt and reduced to powder, is added to the grapes when these are being crushed in the lagar, in small quantities at a time.

(To be continued.)

* The quotation is from Dr. Frédéric Cazalis' *Traité Pratique de l'art de faire le vin,* Montpellier 1890, in which the question is exhaustively dealt with.

MARKETING ON THE HOOF.*

PROBLEM OF THE OAT CROP.

J. L. Dore, Agricultural Editor of "The Leader."

An interesting problem is the Victorian oat crop, the total annual yield of which during recent years has varied from 5,000,000 to 13,000,000 bushels. Last harvest's yield was 11,000,000 bushels, and the quantity that the ordinary market can absorb averages about 7,000,000 bushels. When the yield exceeds this quantity there is a glut, and the result is low prices. This year, the prices of good feeding oats are quoted at from 1s. 8d. to 1s. 10d. per bushel; which after, deducting threshing, bagging, carting, and railway freight to market, means something like from 1s. 4d. to 1s. 6d. on the farm. The safety valve against local glut prices is an export trade. For wheat, butter, mutton and lamb there is an export trade, but there is no export of oats. That being so, the question is whether it would not be profitable to take advantage of the mutton and lamb export trade in dealing with the oat crop surplus.

Experiences in America.

Some notes in this connexion were taken during one of the agricultural tours through America the writer of this paper made under instructions of the proprietors of *The Leader*. Fort Collins, in Colorado, one of the mid-western States, is an irrigation district which produces large quantities of maize and lucerne hay. The Fort Collins business of lamb fattening is so profitable that it is largely extending every year. This industry was started several years ago by a farmer who had bought 1,500 head of lambs on the Wyoming range for the purpose of shipping them to the eastern market, when a blizzard caused him to unload at Fort Collins and put his lambs on feed. They thrived so well and so cheaply on maize and lucerne hay that his neighbours began following his example, and so the business has grown. The farmers in the Fort Collins district contract with the raisers of store sheep on the New Mexico and Wyoming Ranges early in the spring for their lambs, and fatten them for the eastern markets. At Fort Collins, the lambs are unloaded and driven to the feeding pens, which are to be found now on practically every farm. The ewes and lambs for the first three weeks at the start are given all the lucerne hay they will eat, and then they are given the maize. The feeders use only maize and lucerne, the proteid of the corn combining with the carbo-hydrate of the lucerne to form a well balanced ration. The maize feeding is commenced with ¼ lb. per head daily, which is increased gradually until they are getting 1 lb. each at the end of the month. The average increase in the weight of lambs is 10 lb. per head per month. The grain is fed in low troughs in a separate enclosure, which is close to the maize bin. Lucerne is kept in small racks in the pens where the sheep may get at it day or night, and they have access at will to a plentiful supply of good fresh water. Last year, the Fort Collins lambs returned in some instances as high as 8s. profit on the feeding. Few farmers feed less than 500 sheep or lambs, which, after fattening, are put on the cars and sent on to the Chicago, Kansas, and other markets to the eastward. The Fort Collins farmers now fatten 1,000,000 sheep and lambs each year.

* Paper read at the Seventh Convention of the Victorian Chamber of Agriculture, held at Bendigo, July, 1909.

Victorian Experiences.

Already a beginning has been made in several parts of Victoria at sheep and lamb fattening with oats and chaff taking the place of the American maize and lucerne hay. The oats are found to be fully equal, if not superior, in fattening value to maize, and if the oaten hay is not quite equal to lucerne hay, it may be anticipated that, under Mr. Mead's pushing forward of lucerne growing under irrigation, the production of lucerne hay will steadily increase. Those farmers who are fattening with oats explain that the oat crop is one that they have to grow, as it is the staple cereal of the southern districts, and an essential crop in the wheat-growing rotation of the north. The proneness of the land in the wheat-growing districts to grow wild oats has been the reason for the most successful men not taking off more than one wheat crop after fallow, which of course means, wheat one year and fallow the next, or only one crop of wheat from the same land every two years. It is now found that two grain crops can be safely and profitably taken off after the one fallow by making one of them oats. A feature in this practice is that the objection to a second crop of wheat after fallow, with regard to the difficulty of keeping the land clean, does not exist in the case of an oat crop. In the one case, the weeds get the better of the young wheat after sowing, and in the other the young oats get the better of the weeds. Then, again, those who have tested this practice assert that there is always a good oat crop after wheat. Thus, the best rotation is found to be wheat after fallow, oats after wheat, then a year or two out under grass; then fallow after the grass, followed by wheat again, and after that oats, and so on with the fallow, wheat and oats and the grass, as before, while the manures put in with the crops are found to greatly improve the grass and herbage that follows the crop years, both in quantity and quality. Those who are adopting this system of rotation remark that evidently an oat crop takes a different class of plant food from the soil to wheat. In the fact that oats are shallower rooting than wheat may be found some explanation of this. Consequently, taking into account the advantages of the oat crop rotation in its greater certainty, as a second grain crop after fallow, as compared with wheat, alike in weed cleaning, yielding and benefiting the soil, this is found to be remunerative practice, even in the value of the oats as a grain crop alone, not to speak of the sheep feeding profit.

Feeding in the Sheaf.

There are two methods adopted in feeding the oats, the one feeding in the sheaf and the other manger feeding. As a representative example of the sheaf feeding system, Mr. G. W. Wallace, of Kamarooka, between Bendigo and Echuca, may be mentioned. Mr. Wallace first resorted to oat feeding in order to tide his sheep over the dry months which often occur between January and May. His plan is to feed the crop in sheaf form, and in order to do this he harvests the hay on the green side after it has come well into ear, so as to develop a good kernel of grain. In this way he finds that the sheep do best, because they get the oats and the hay together in such proportions of grain and stem as to do them most good. In carting out the hay from the stack, a rough estimate is made that the sheaves run on the average about 7 lbs. each, and on this basis the loads are distributed through the paddocks according to the number in each, at the rate of half a pound per head; that is, grain and stem together. Thus each sheaf of 7 lbs. provides a daily feed for fourteen sheep. The sheaves are dropped off at intervals of a few yards apart, as the load is

driven along, the bands cut (care being taken to collect the string, so that it may not get mixed in the feeding), and the hay scattered about. As a proof of the nutritive character of this class of feeding, it is explained how, during a recent severe autumn drought, that a flock of ewes in a paddock as nearly as possible quite bare of grass, was lambed down on three-quarters of a pound of sheafed hay per day each, and the lambing returns reached 75 per cent.

FEEDING IN FIELD MANGERS.

Mr. Sproat, of Banyenong, in the Donald district, began with the sheaf system, but now threshes the oats, and cuts the hay into chaff in order to feed in mangers. His experience is that the hay cut into chaff is more profitable than long hay, while an oil engine comes in for the chaffcutting. The field mangers consist of ordinary grain bags opened out and simply made by stretching a square of four wires between two trees any length required, supported in the middle by low posts. The wires, being the support for the bags, make an excellent trough. This plan is considered the best, especially at lambing time, as the sheep can go to the mangers at any time and get a feed, taking their lambs quietly with them, whereas in scattering sheaf hay, the minute the sheep hear the rattle of the waggon they rush off, and some of the lambs get mis-mothered. Another advantage of the chaff over the sheaf system, in Mr. Sproats' opinion, consists in the sheafed hay having to be stacked, as against chaff, which, being stored in a barn or silo, is thus better preserved from the mice. As against this, however, Mr. Wallace sets the cost of threshing, which is saved in the sheaf feeding method.

PROFIT OF OATS FEEDING.

Whichever plan of feeding is adopted, however, the profit is generally admitted. A wheat grower in the Benjeeroop district, Mr. Hugh Milvain, has proved in his own experience that half a pound of oats per day, either with chaff or in the sheaf, will maintain sheep in good condition. Two bushels of oats, fed at the rate of 2 lb. per day, together with hay or chaff, and access to picking in the paddocks, will fatten a store wether fit for market. A farmer, in his opinion, should not sell oats unless he sees 3s. per bushel for them in the stack, as by feeding sheep he is assured of this, and for topping up lambs more.

THE ADVANTAGES SUMMARISED.

Another important point is the getting of lambs for export early on the market, as the early market, from the latter end of August to the beginning of October, always commands the best prices. In this way, oat feeding gives extra profits in two ways—earliness and primeness of quality; because, with plenty of oats on hand the grower is rendered independent of such contingencies as a poor grass season at the very time when the feed is most required. Even before lambing, the ewes are put in a better position for raising vigorous lambs by having the advantage of the oat feeding; and, after lambing, the young lambs are kept rapidly improving from the beginning by the ewes being kept in good milking condition. As one farmer puts it, "the best way to get early spring lambs of prime quality is to begin feeding them through the ewe before they are born, and in every way you can name, growing oats as a second grain crop succeeding wheat after fallow, for sheep feeding, is one of the most profitable movements connected with the combined wheat growing and lamb fattening systems; because, over and above all the other advantages, it further enables a farmer to at least

double the number of ewes he can carry on his farm." Thus, in the use of oats for sheep and lamb fattening, the value of the crop is proven by those who are adopting this practice to be worth fully 3s. per bushel on the farm, as compared with the 1s. 6d. which remains after deducting cost of bags, carting, and railway freight from the present market prices. Consequently, those who thus utilize their oat crop stand to benefit from the sheep fattening profits, and those who do not also participate, owing to the tendency to increase prices on the local market by the oat crop surplus being got rid of by the export trade in sheep and lambs.

A RECORD CROP OF POTATOES.

The accompanying illustration is that of some "Acme Snowflake" potatoes grown by Mr. S. S. Smith, of "Iona," Gellibrand West, *viâ* Cobden.

Mr. Smith writes as follows:—"Herewith I forward a photograph of a few potatoes from a record crop of Acme Snowflakes produced by thorough cultivation. The land was worked into a fine tilth about 10 inches deep with a Massey-Harris cultivator. The potatoes were then put in as deep as possible with a mouldboard plough during the last week of October, 1908.

"No rain fell until after the blooms had died off, yet, owing to the surface being kept well stirred until the tops 'shook hands' across the rows, they turned out in the beginning of June at the rate of 30 tons per acre. Single tubers weighed as much as 5 lbs. each; 62 filled an old-style cornsack and weighed 190 lbs. Placed end to end the 62 tubers measured 54 feet.

"Some land immediately adjoining was planted in the ordinary way, but yielded only 9 tons per acre."

THE PROGRESS OF AGRICULTURE IN THE STATE SCHOOLS OF THE SALE (EAST GIPPSLAND) DISTRICT.

E. R. Davey, M.A., LL.B., Inspector of Schools.

Agriculture is now taken as the Science Course in 55 of the schools in this Inspectoral District. About 50 of them have undertaken the course for the first time during the past twelve months, and the efforts made have generally been attended with much success. This may largely be accounted for by—

(*a*) The suitability of the district;
(*b*) The enthusiasm of the teachers; and
(*c*) The interest manifested in the work both by children and parents.

MAIZE PLOT, ORBOST SCHOOL.

There is no doubt that this vast district has never been experimentally treated, and soils which have long been discarded, are now being found to give results of which they were thought quite incapable. Some of the most striking results obtained in the school plots during the past year might be mentioned:—

At Bengworden, where the school plots consist of a light sandy loam, potatoes were produced weighing as much as 2 lbs. 10 ozs.—the largest ever grown in the district. On this sandy soil, too, the sugar beet, maize, and pumpkin crops were very good; but the thousand headed kale, which is new to the district, throve so well, that it is now being planted generally by the farmers in the locality.

Again, at Longford school, where the soil consists of almost pure sand, a plot was sown with cow peas, which made such excellent growth through a long and dry summer—while all the other plants, more or less, completely succumbed to the heat—that they formed a very valuable object lesson to the farmers on drought resistance, many of whom are now planting them as a summer fodder for their cattle.

Again, at the Fernbank school, where the soil of the district is very sandy and undeveloped, a plot of paspalum aroused much local interest. This grass proved itself to be particularly suitable for poor sandy soils, having such vigorous growth as to gradually kill the bracken ferns which grew up amongst it. Its success on the school grounds has induced many of the residents to plant portions of their farms with it.

As the Gippsland district has been suffering from a succession of droughts, it became a matter of intense interest as to which grass would

POTATOES GROWN AT BENGWORDEN SCHOOL PLOT.
Weight of largest, 2 lbs. 10 ozs., the heaviest grown in the district.

be best able to survive the long summers. At Ensay, however, it was found that a plot of paspalum was luxuriant right through the hot season, a striking circumstance in connexion with it being the fact that it was the only plant in the garden unaffected by the drought or locust pest, both of which had been particularly severe last summer.

SOME OF THE PRODUCE OF THE SALE SCHOOL PLOTS.

Enough has been shown in the foregoing to give an idea of the nature and value of the experimental work done on the plots, and of the possibilities of a school subject which is, as yet, in its very infancy. Again, this vast and unknown district presents a rare opportunity for collecting, polishing, and advertising its great variety of timbers. Many schools now

either possess, or are engaged in making collections of their local timbers, both in the rough and smooth states, their economic uses and values being investigated, the foliage and bark being also secured, mounted, and labelled, for purposes of identification. In the same way, collections of the local noxious weeds and pests are made, and the methods of their eradication set out.

LAKE TYERS SCHOOL CHILDREN (BLACKS AND WHITES) TAKING OBSERVATION NOTES ON THE GROWTH OF THEIR PLOTS.

Agriculture is treated educationally in the schools by a series of scientific experiments, in which the child's powers of observation and reasoning are carefully and systematically cultivated. The results of all the experiments are clearly set out in note-books.

SCHOOL CHILDREN AT WORK, KALIMNA.

The course embraces—

(a) The formation and analysis of soils (correlated with physical geography);
(b) The nature and value of humus;
(c) Plant foods and how obtained (Osmosis), and their availability at different depths of soil;
(d) The water-holding capacity of soils—the necessity for drainage;
(e) Tillage, mulching, the progress of plants in dry, drained, and saturated soils.
(f) The growth of plants under varying conditions.

In the outdoor work on the plots, the conclusions obtained inside are further put to practical tests. In the school plots various varieties of cereals, fodders, fibres, grasses, fruits, and vegetables are cultivated. The "comparative" method of experiment is employed, and the plots are prepared with and without manures, which generally consist of superphosphates, sulphate of ammonia, and sulphate of potash. But other kinds are

AGRICULTURAL PLOTS, SOUTH BUCHAN STATE SCHOOL.

tried as well. The manures are supplied the schools free by the Department of Agriculture, and I desire to express our gratitude to Messrs. Cuming, Smith and Co. for their liberality in supplying, on application, samples of their manures to the schools.

SALE NORTH SCHOOL, WITH GARDEN AND PLOTS.

Other useful lessons are given incidentally, *e.g.*, milk testing. Several schools now possess the Babcock tester, and the children are regularly taught to test the value of the milk from different cows in the neighbourhood.

The invaluable aid of the silo to the farmer for preserving fodder for winter use is shown, a gradually increasing number of the schools having silos of their own, which are filled with silage grown on their plots.

That most important part—the domestic side—is not neglected, and where practicable, lessons on the methods of preserving the products in the form of jams, jellies, pickles, sauces, &c., are given the girls at convenient times, either by the teacher or outside expert.

The teachers have been enthusiastic, and have made the most of their knowledge and the information available. The various District Teachers' Associations now invariably discuss Agriculture and the forthcoming Royal Show at their meetings. As indicated by the photographs, an enormous amount of work has been done, and very satisfactory headway made. The syllabus of work provided by Mr. J. P. McLennan, Supervisor of Agriculture, has been closely studied, and each child and teacher provided with a text-book (Kirk or Bailey), which is read and discussed both in school and at home. Much, in addition, has been learnt from the experienced farmers of the district, who look upon the work with a very friendly eye.

THE FORGE CREEK SCHOOL GARDEN.

No subject in the curriculum is viewed with greater interest than agriculture. This is only reasonable. Agriculture is the natural corollary to Nature Study, and gives a striking finality to its teaching. Moreover, the pupil comes to school with a, more or less, rough and ready acquaintance with the subject, and is quick to see in it a means of gaining a future livelihood, and improving his father's farm. He finds, too, on the part of his parent, a sudden willingness to discuss with him the agricultural work done in school and the progress made by the different plots.

A most gratifying feature, however, in connexion with the introduction of agriculture into the State schools of this district is the sympathy and co-operation shown by the parents and general public in the work. The required plots are invariably given by the parents. At Orbost (Snowy River), the Head Teacher, Mr. N. F. Spielvogel, had six quarter-acre plots offered, averaging £50 an acre in value. At Bruthen, an acre of similar

land was immediately provided. The parents, too, have always done the greater portion of the fencing (wire-netting), clearing, and preparing the plots for cultivation. No doubt they recognise in it a form of technical

EXPERIMENTS AT THE BUNDALAGUAH SCHOOL.

education absolutely necessary for the successful settlement of their children on the land, and the development of the resources of the district.

The assistance so freely given by the parents has been very encouraging. I also wish to record my keen appreciation of the generosity of the following public bodies in their response to our appeal for assistance in suitably

AGRICULTURAL LESSONS, "FRIENDS AND FOES," GLENMAGGIE SCHOOL.

furnishing a district exhibit for the forthcoming Royal Agricultural Show in Melbourne next September:—Orbost and Bairnsdale Shire Councils, the Bairnsdale, North Gippsland, Maffra, Orbost, and Omeo Agricultural Societies, and the local Branches of the A.N.A.

SUCCESSFUL POULTRY FARMING.

H. V. Hawkins, Poultry Expert.

Poultry raising is at last becoming a leading branch of farm husbandry. The demand is increasing year by year; our own markets are able to consume all the eggs and dressed poultry we produce. The export trade to Great Britain is very small and can be greatly increased if farmers will raise more poultry of the proper breeds and type and finish them off before they are put on the market. Too many farmers are paying little or no attention to the kinds of poultry they have, and they forward them to the market without being fattened. A low price is obtained because the birds are thin, and then it is said that poultry does not pay. Far too much of this class of poultry is put on the markets every year, and the prices realized are not profitable, as the demand for this grade is limited. On the other hand, good prices have been paid for properly finished birds. It costs no more to raise a pound of chicken than a pound of beef or pork, and not nearly as much where they have free range of the fields after the harvest is over. The farmer can raise chickens much more cheaply than any one else if he has the proper equipment for handling them.

A farmer should endeavour to keep at least 100 hens of some good utility breed, such as Black Orpingtons, White Orpingtons, White and Silver Wyandottes. He should pay special attention to selecting the proper type—low set, full breasted birds. The successful poultry farmer selects one breed, and sets his mind on that breed. By careful handling and breeding at the right time of the year (July, August, September), he succeeds in raising large numbers of cockerels which find a ready sale and pullets which will prove decidedly profitable in the autumn and winter when the new laid egg is so scarce. Such a farmer I had the pleasure of visiting a few days ago. His property is known as the "Yarrowee Egg Farm," and is about a mile from the Upper Fern Tree Gully railway station.

The owner, Mr. G. W. Chalmers, originally carried on dairying, and had about 200 fowls, which he fed exclusively on skim milk during the flush of the milking season. His method was, after each milking, to put the skim milk from 25 cows into six barrels, each having a tap at the bottom to draw off the whey. The milk was left in the barrels until all the solids had risen to the top, and all the whey had drained out. In this condition, the solids are of the consistency of crumbly cheese; and are very much relished by the poultry. In the warm weather, the milk thickens and drains very rapidly. A close cover is kept over the barrels to keep out the rain, as the milk will not thicken if mixed with water. In cold weather it will not thicken unless first soured and warmed.

With the milk from 25 cows, Mr. Chalmers states he has fed 200 fowls for three months, no other foods being given, at a time when eggs were plentiful, and the health of the birds perfect. During this time, the fowls had a wide range on good pasture.

Two years ago, Mr. Chalmers decided to go in entirely for poultry farming. His success undoubtedly affirms the oft-repeated question, "Does Poultry Farming Pay?" At the present time, he has 650 Black Minorca hens and 900 chickens all hatched by incubators, and out within a week. Last year, from 400 fowls, his gross returns were £250. He has by careful selection built up a splendid laying strain, surely an evidence that "a breed is what one makes it." There is no reason to doubt that the Minorca is capable of holding its own with the Leghorn, and at the same time it produces a much finer egg.

The whole of the flock run together, and are housed in a large well-lighted shed, 120 x 40 feet, made of galvanized iron. In wet or boisterous weather they are kept in. The outside run comprises the whole of the surrounding paddocks, but the birds seldom travel far; in fact, 7 acres is all they graze upon.

Special attention is given to the comfort of the birds. They perch at night in the centre of the shed, that portion being paved with bricks The perches are less than 2 feet high, so no injury results from the hard floor. Only one drinking vessel is provided, in the shape of a securely fastened jam tin placed immediately under a tap which is constantly running; the overflow is carried away by means of an underground agricultural drain.

A rather novel machine is used by Mr. Chalmers for mixing the mash. He has a large square box which holds about ten kerosene tinfuls of feed. Through this box is fixed an axle of 1-inch iron piping, to which shafts are attached, after the manner of a hand truck. On each end of the box, wooden wheels are fixed, and on one side a lid securely closes in the meal, which consists of 2½ bushels of pollard, 50 lbs. of potatoes, and 2 kerosene tinfuls of boiled vegetables, and occasionally a few minced boiled rabbits, or dry blood meal, in all weighing about 150 lbs. Sufficient hot liquid is added, and the box is wheeled down the incline where the birds are usually fed. By the time it reaches the spot, the constant churning has mixed the food to a fairly crumbly condition. The food is then scattered broadcast on a space of about a quarter of an acre. Much time is saved by this novel, yet simple, device, which might well be adopted by other poultry breeders having a large flock to feed.

At the writer's suggestion, Mr. Chalmers recently made a drastic change in the grain ration, short white oats being fed in lieu of maize to pullets, with the result that the egg yield from 275 pullets increased in six weeks from 55 to 173 per day.

Twelve outside brooders are used. They are sheltered behind a thick hedge, and the chickens are allowed out when a few days old. Care is taken to place a wire-netting fence around the brooders until the chickens become accustomed to their surroundings, when they are given free range. When tired, or cold, they return to their respective foster mothers. There is no doubt that the early chicken thrives well; the loss is greatest with those hatched out in November and December, when there is a shortage of sweet and tender grass and insect life.

Many make the serious blunder of feeding young chicks on grain. When 24 hours old they should have hard-boiled eggs and stale bread-crumbs, with a sprinkle of dry oatmeal, slightly moistened with warm skim milk, given five or six times daily—a little and often. A few days will suffice to strengthen them. They then require more freedom; scratching for themselves they pick up insects and eat off the tops of young grass. They thus secure a mixed diet and thrive well. Mr. Chalmers markets all his cockerels when ten or eleven weeks old. Last year's youngsters realized 4s. 6d. a pair off the farm.

It is pleasing to record that Mr. and Mrs. Chalmers by their success have exploded the idea that poultry does not pay. Their success also indicates wherein lies the failure of others who have foolishly attempted to farm poultry and at the same time to carry on some other occupation which engages practically all their attention during the day.

It is hoped this brief account of the "Yarrowee Egg Farm" may be the means of further stimulating a deeper and more active interest in this important branch of farm work.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information ι farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as ıll particulars as possible, of your local conditions, and state ı recisely what it is that you want to know. ıll inquiries must be accompanied by the name and address of the writer.

STRANGLES.—W.B. asks what treatment is recommended for horses affected with Strangles?

Answer.—Put the horses on a soft laxative diet; steam the head twice daily with 30 drops of turpentine on boiling water; rub the glands of the throat with a mild stimulating liniment, and, when they "point," open them at the lowest point, and then twice a day syringe out the wound with a solution of perchloride of mercury, 1 part, water 1,000 parts. Give in the drinking water 2 ozs. hyposulphite of soda to every bucketful.

NON-SERVICE BY BULL.—H.J. states that his bull, 3 years old, refuses to serve the cows. The bull is fed on lucerne hay and green feed, and is in first-rate condition. Occasionally the bull goes out with the cows, but about half the time he is kept in an enclosure, 8 yards square.

Answer.—It would be wise to reduce the condition of the bull very considerably and give plenty of exercise; the yard is far too small. If, when in poor condition, he does not show more vigour, try the giving in the feed, night and morning, for a fortnight, of powdered nux vomica, 1 dram; carbonate of ammonia, ½ oz.; gentian, ½ oz. During the period of reducing his condition do not allow him service.

INJURED FETLOCK.—J.McP. states that a foal belonging to him got caught in a plain wire fence, and both sides of the hind fetlock were cut deeply. The wound was treated with lysol, lime-water, and olive oil, and has almost healed, but the swelling remains. He asks how to reduce the latter?

Answer.—It would be impossible to reduce the leg to normal, as there will always be a certain amount of scar tissue. In time, however, it will be found that the swelling will slowly reduce without interference. It is not wise to apply blisters, &c., for some time after healing of the wound. About three weeks after such healing a red blister may be applied with benefit.

NAIL IN HORSE'S FOOT.—A.H.I. asks which is the most efficacious method to adopt when a nail enters deeply the sole of a horse's foot alongside the frog.

Answer.—The hoof must be pared away over the seat of puncture and right down to the sensitive sole so as to insure perfect drainage for any pus which may accumulate. Then the part is washed out thoroughly with an antiseptic, such as carbolic acid 1 part, water 20 parts, and the opening plugged with cotton wool and kept clean and dry by enclosing the foot in several thicknesses of sacking.

DISCHARGE FROM MARE.—L.B. writes—"A mare of mine has for nearly two months been passing small quantities of blood from the vagina. The mare is aged and seven months in foal. Her health and condition are excellent, and there is no appearance of pain or inconvenience."

Answer.—Without an examination it is difficult to say the cause. Are you sure she is in foal? If so, nothing can be done until after parturition, when if the trouble continues write again in regard to the matter.

CONTRACTED TENDONS.—J.B. writes—"I have a valuable medium draught horse that I do not wish to destroy. It has had corns on one of its hind hoofs, and somebody, in trying to cut them out, has so injured the foot that the animal walks on its toe. The back tendons or sinews are contracted. Can the horse be cured by a surgical operation?"

Answer.—An operation can be performed for overcoming the contracted tendons, but it would be advisable to try the effect first of a shoe having a projecting piece of iron in the toe some two or three inches long and turned back against the hoof so as to avoid catching in logs, &c. Gradually the weight of the limb acting on this lever stretches the tendons back.

LUPINS.—J.R.M. wishes to know whether the lupin bean has any feeding value.

Answer.—Lupins are especially valuable for green manuring on poor sandy soils rendering those fit for ordinary cultivation. They contain more digestible albuminoids (nitrogen food) than any other crop, and hence are sometimes fed to sheep green or in the form of hay. Their bitter taste usually make them unpalatable at first, especially to horses and cattle, and, in addition, they sometimes contain a poisonous alkaloid, *lupinot oxine*, of which moderate quantities rapidly produce fatal results. The poison is destroyed by steaming the fodder under moderate pressure (1-2 atmospheres). Lupins have a deep root, stand drought fairly well, but cannot stand chalky soil, stagnant water, or black peaty or humus soils.

Ulcerated Penis of Horse.—J.T. asks what treatment is recommended for ulceration of the penis. He thinks that the injury was caused by a driver cruelly cutting the horse with his whip under the flank. At times the sheath swells up tremendously, and a bad smell arises from the seat of the injury.

Answer.—It would be advisable to have the parts thoroughly cleansed with a solution of lysol and water; then cauterize the wounds with nitrate of silver. Care should be used when applying the nitrate of silver, otherwise healthy tissues may be destroyed. The wound should be slightly touched with the caustic once every third or fourth day.

Mussel Scale.—S.J. asks what treatment is recommended for mussel scale on apple trees.

Answer.—Spray with crude petroleum oil emulsion in winter at a strength of 1 part of emulsion to 9 parts of water. To make emulsion, boil one gallon of water and 2 lbs. of soft soap until soap is dissolved, then add 2 gallons of crude petroleum oil and bring to boil. Agitate violently until emulsified.

Best Spray for Codlin Moth.—G.S. asks which is considered the best spray and when it should be applied.

Answer.—The best spray for Codlin Moth is arsenate of lead and the best times to spray are (1) When petals fall. (2) When eggs of moth are present on fruit or leaves. (3) At intervals of 10 to 14 days, two more sprayings. (4) In February, to catch late summer brood.

These are general instructions, and must be modified according to local habits of the moth.

Manuring Vines.—R.G. (Hopetoun) asks several questions relative to manuring vines.

Answer.—In a general way it is advantageous to manure as early as possible—before the first winter ploughing. In the case of chemical fertilizers, phosphoric acid and potash cannot be applied too early. Readily available nitrogenous manures, such as sulphate of ammonia or nitrates, should be applied later on in early spring. In France, an application of manure which contains, per acre, 80 lbs. nitrogen, 40 lbs. potash, and 120 lbs. phosphoric acid is considered a very heavy dressing. It would not be judicious to exceed these quantities, especially as regards nitrogen. A complete manure, that is, one containing potash and nitrogen in addition to phosphoric acid, will give the best results. Nitrogenous manure should be applied separately.

Value of Kainit.—R.K. asks whether kainit is best used by itself or mixed with other manures.

Answer.—Kainit is an impure form of potash containing 12½ per cent. of potash and fairly considerable proportions of common salt. It has a circumscribed value for root crops or vegetables, but its value for most other crops is minor one. The great majority of the soils of Victoria contain abundant supplies of magnesia. Thorough cultivation of the land will do more to increase the production of crops than expensive forms of artificial manures. Kanit can with safety be mixed with all manures. If added to Thomas phosphate or lime, the mixing should be done just prior to use.

Manure for Oat Crop.—R.E.S. asks which is the most suitable manure for growing oats for hay in the Box Hill district. The soil is poor, and appears to contain a large percentage of clay. It appears to be suitable for fruit trees, but it takes a lot of working to get it nice and mellow.

Answer.—Artificial manures should not be expected to effect an improvement in the physical character of the soil. If the land is stiff clay inclined to bake into clods in summer, it should receive a dressing of 5 to 8 cwt. of lime per acre, as well as all the farm manure obtainable. Draining would also help to make the land more mellow. For oat growing a mixture of one-half each of superphosphate and bonedust to the amount of 1 cwt. per acre would give good results.

Cork Stripping.—A.V.B. inquires as to what time must elapse after planting before the first crop of cork can be harvested.

Answer.—The first crop of cork is usually obtained at the age of 15 years. A stripping of bark for tanning purposes is often removed at 4 years old. When in regular production the trees are stripped every 8 or 10 years. Under exceptionally favorable circumstances a crop of cork can be stripped from 10 year old trees.

Carob Trees.—P.L. asks where young carob trees can be obtained.

Answer.—Young seedling carob trees are obtainable from the leading nurserymen in Melbourne. To obtain the best results these should be budded with the heaviest bearing varieties. Many of the seedling trees produce male flowers only, and are therefore incapable of bearing beans.

Peas for Pigs.—P.H.L. asks which is the most profitable variety of peas to sow for harvesting as pig feed.

Answer.—The Dun pea, which can be planted at once, is recommended for pig feed. They should be stacked, not threshed, and fed to the pigs in the straw.

Sowing Lucerne.—D.W. inquires whether lucerne can be drilled with the ordinary seed drill.

Answer.—Lucerne can be drilled with an ordinary grain drill, if mixed with manure or earth and sown through the manure box. It is advisable to stop every alternate feed and sow about 14 inches apart.

Solids in Milk.—X. asks how much dry matter is contained in skim milk and butter milk.

Answer.—The approximate quantity of solids (protein, carbo-hydrates, ash, &c.), per 100 lbs. is as follows:—

	Separator Skim Milk.	Butter Milk.
Protein	3.55 lbs. ...	3.60 lbs.
Carbo-hydrates	5.35 " ...	4.50 "
Ash, &c.	0.80 " ...	1.30 "
Total solids	9.70 lbs. ...	9.40 lbs.

Poultry Breeding and Feeding.—F.E.E. makes various inquiries relative to poultry breeding and feeding.

Answer.—1. Breed from mature hens, second or third year, with vigorous cockerel, nine to twelve months old.

2. The best time to hatch for the market is in June, July, and August, to catch the Melbourne Cup, November, and December markets.

3. The time to hatch for winter layers is July, August, and September.

4. Condiments are not recommended for laying fowls. Feed 2 parts pollard and 1 part bran; add 1 oz. of meat scrap or dry blood for each bird to the daily ration, also a 15th part of lucerne chaffed finely. Mix thoroughly with hot water or soup until crumbly and feed about 2½ ozs. to each bird daily. At night give about 1½ ozs. of equal parts maize and short oats or wheat.

5. Brown shelled eggs realize higher prices in London than do white shelled eggs. Orpingtons and Plymouth Rocks lay the largest brown eggs.

Separated Milk for Poultry.—E.G. asks whether separated milk is good for poultry, and how it should be fed. Her practice is to allow some to stand until it thickens; it is then placed in a fire and when it curdles the whey is poured off.

Answer.—Milk curd, but not in excess, may with advantage, be given to laying hens and pullets. It should be mixed in the hot mash with the pollard, bran, meat, &c. Avoid stickiness; mix it so that it will be friable. Sweet skim milk is much more beneficial than curds for young chicks. Avoid giving any sour food to young chicks.

Pumpkin Pips affect Poultry.—J.M. states that every year he grows a large quantity of pumpkins which are cut up and placed in small heaps for the cows. Afterwards the turkeys and fowls pick up the seed, with the result that their heads get very red, and they are unable to walk.

Answer.—An excess of any vegetable matter will usually affect laying hens. Pumpkin pips are a most unsuitable food for egg production. If fed, they should be always ground up and mixed with other ingredients, such as barley meal, maize meal, pollard, and a little animal food.

Best Straw for Thatching.—J.B. asks which is the best straw to grow for thatching.

Answer.—Rye.

Waterproofing of Tarpaulins.—W.G. requests information concerning the waterproofing of hay covers.

Answer.—The practice in connexion with the waterproofing of tarpaulins used on the Victorian Railways is as follows:—

Waterproofing.—The dressing consists of double boiled and raw linseed oil, in equal parts, mixed with vegetable black, in the proportion of 9 lbs. to 40 gallons. The covers are dipped in a bath of this liquid, then rolled out and dried and again passed through the bath.

Drying.—The covers are hung at a distance of not less than six inches from each other. The time required for drying between the coats, and before the issue of the tarpaulins to traffic must be determined by examination, as the composition will dry much more quickly in hot weather than in a cold or damp atmosphere.

STATISTICS.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 30.6.1909.	Quarter ended 30.6.1908.	Quarter ended 30.6.1909.	Quarter ended 30.6.1908.
Butter	lbs.	2,009,268	1,518,720	603,568	613,256
Milk and Cream ...	cases	7,173	3,930	50	.
Cheese	lbs.	179,280	135,000	19,620	45,800
Ham and Bacon ...	"	373,440	525,840	.	.
Poultry	head	1,545	7,014	319	1,445
Eggs...	dozen	...	420	21,155	27,559
Mutton and Lamb	carcases	16,274	91,140	75	15,659
Beef	quarters	1,305	24	..	20
Veal	carcases	552	1,039	30	419
Pork...	"	..	184	.	136
Rabbits and Hares ...	pairs	308,556	740,202	120,186	168,006
Sundries	lbs.	...	...	385	5,091

R. CROWE, *Superintendent of Exports.*

Description of Produce.	Imports.		Exports.		Description of Produce.	Imports.		Exports.	
	Australian.	Oversea.	Australian.	Oversea.		Australian.	Oversea.	Australian.	Oversea.
Apples ...	263	1	40,331	30,411	Mixed fruit	1	—	2	—
Apples, Custard	4	—	—	—	Mushrooms	—	—	1	—
					Nutmegs ..	—	175	—	—
Bananas, b/s.	77,024	—	—	—	Nuts ...	100	1,710	25	—
Bananas, c/s.	4,824	835	828	—	Oats ...	8,367	1,140	—	—
Barley ...	9,828	25	—	—	Olives ...	3	—	—	—
Beans ...	136	191	—	—	Oranges ...	45,008	402	120	217
Blackberries	121	—	—	—	Passion fruit	3,383	—	333	21
Bran ...	—	575	—	—	Peaches ..	—	—	88	—
Bulbs ...	2	27	5	—	Pears ...	3	—	46,849	2,120
Cattle food	—	1,370	—	—	Peel, orange	—	42	—	—
Chillies ...	—	93	—	—	Persimmons	33	—	—	—
Citrons ..	5	—	—	—	Pineapples	10,260	—	204	157
Cocoa beans	—	12	—	—	Plants ...	393	228	612	—
Coc'nut fibre	—	3	—	—	Plums ...	—	—	42	—
Cocoanuts..	—	421	—	—	Popcorns ...	—	15	—	—
Coffee beans	—	1	—	—	Potatoes ..	4,290	—	—	—
Currants ...	247	1,401	—	—	Quinces ...	—	—	3,592	10
Dates ...	—	1,250	—	—	Rice ...	1,984	58,088	10	—
Dried peas	9,870	450	—	—	Seeds ...	744	7,563	1	—
Garlic ...	7	6	—	—	Strawberries	—	—	5	—
Grain ...	—	60	—	—	Sugar cane	—	6	—	—
Grapes ...	39	—	25	312	Sultanas ...	—	5,458	—	—
Green ginger	42	1,033	8	—	Tomatoes ...	39	—	5	—
Lemons ...	5,395	—	43	819	Turnips ...	3,404	56	—	—
Lentils ...	—	115	—	—	Wheat ...	419	23	—	—
Linsee ...	—	522	—	—	Yams ...	55	266	—	—
Mace ...	6	31	—	—	Dried fruit	—	—	1	5,216
Maize ...	3,025	15	—	—	Fruit in liq.	—	—	—	1,767
Malt ...	15	—	—	—	Jams, Sauces, &c.	—	—	—	1,586
Mandarins	2,063	—	—	44					
Mangoes ...	—	3	—	—	Plants, trees, &c.	—	—	—	410
Melons ...	—	—	1	11					
Totals ...	112,916	8,440	41,241	31,597	Grand Totals	191,402	83,612	93,131	43,101

Total number of packages inspected for the quarter ended 30th June, 1909 = 411,246.

J. G. TURNER, *Senior Inspector, Fruit Imports and Exports.*

THE JOURNAL

OF

The Department of Agriculture.

Vol. VII. Part 9. 10th September, 1909.

THE LADY TALBOT MILK INSTITUTE.

First Annual Report, July, 1909.

In presenting its first annual report, the Board of Management of the Lady Talbot Milk Institute takes this opportunity of expressing its keen appreciation of the valuable work done by Lady Talbot in originating and financing this charity, which, coming as it does under the heading of preventative rather than curative medicine, bids fair to be one of the most rational and, it is hoped, successful of all the charitable movements in Melbourne. Lady Talbot's interest in all the charities of Melbourne will never be forgotten, and this Institute, bearing her name, should, with the assistance of the philanthropic public of Melbourne, serve as a living memento of her truly national spirit.

The Lady Talbot Milk Institute was established after the manner of the Gouttes de Lait in France, with the object of reducing the number of deaths of infants in the city and surrounding municipal districts due to milk poisoning in the summer months. It had been pointed out to Lady Talbot, who had been making inquiries regarding the death rate of infants of Melbourne, that a reliable milk supply made available to the poorest in the community would lessen the death rate considerably. At her instigation, the Council of the Victorian Branch of the British Medical Association called a special meeting on 2nd May, 1908, to discuss the causes of our high summer death rate amongst infants and the best means of remedying it. Both Sir Reginald and Lady Talbot were present at the invitation of the Council, and the outcome of the meeting was the establishment of the Institute.

Subsequently a meeting of influential citizens and medical men was called at State Government House, when the chief Charitable Trusts of Melbourne promised, through their trustees present, a sum of £700, and a promise of Government support was given. The main lines of action having been formulated by a provisional committee of medical men, Mr. F. A. Moule drafted a constitution for the proposed Institute, with the kindly assistance of Mr. Mitchell, K.C. A meeting of subscribers was held at the Melbourne Town Hall on 24th June, 1908, with Lady Talbot in the chair. The constitution was adopted, and the institution was named the Lady Talbot Milk Institute. The constitution provided for a Board of Management, and the following members were elected by the

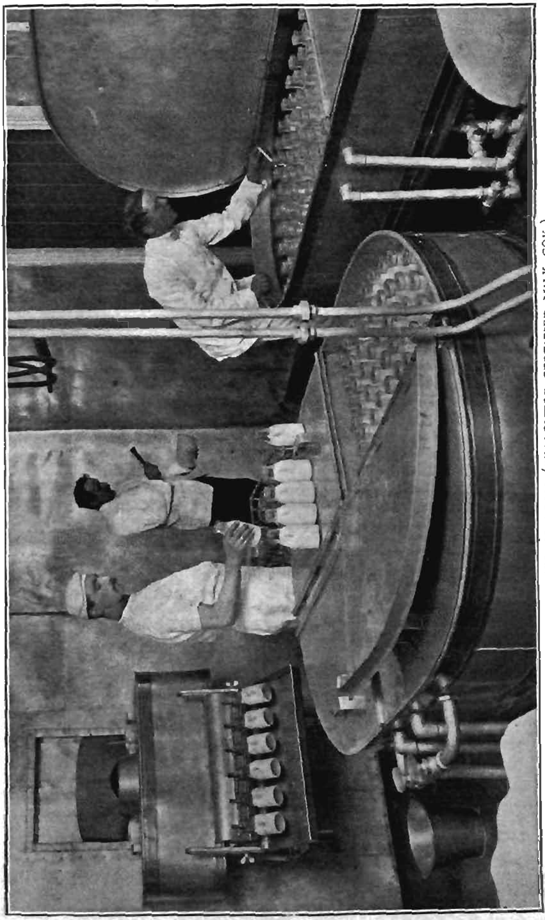
subscribers:—Messrs. W. Morgan and Arthur Payne, and Drs. Stanley Argyle and Jeffreys Wood. The British Medical Association elected Drs. Helen Sexton, W. Boyd, F. H. Cole, J. W. Dunbar Hooper, and W. Atkinson Wood. The following ex-officio members were also appointed to act on the Board as members:—The Minister and Director of Agriculture, the Chairman of the Board of Public Health, and the Director of the Bacteriological Department, Melbourne University. Dr. F. H. Cole resigned, and Dr. Stewart Ferguson was appointed in his place. Dr. Helen Sexton was appointed hon. treasurer, and Dr. W. Atkinson Wood hon. secretary.

The assistance and co-operation of the Government were sought, and the Hon. Geo. Swinburne, Minister of Agriculture, promised both departmental and monetary assistance, and the Hon. E. H. Cameron, Minister of Health, authorized the Department of Public Health to assist the Institute. The Cabinet also kindly voted the Institute £250 a year for two years. Lady Talbot attended the first meeting of the Board of Management, at which Dr. Norris was appointed Chairman of the Board. The first work of the Board was to draw up standard conditions for the production of specially clean milk, and it was announced that a hall mark or certificate would be given to any dairy complying with these conditions, and it was also agreed to permit such dairies to deliver their milk supply in the special bottles bearing the registered mark of the Lady Talbot Milk Institute.

So far, only one dairy farm, that of Mr. Hope, at Caulfield, has complied with the conditions specified, and it was from his farm that all the milk distributed by the Board during the past summer was obtained. The milk was produced by cows that had by the tuberculin test been proved to be free from tuberculosis. The milk was immediately cooled to below 40 deg. F., and delivered at that temperature to the Willsmere Certified Milk Depôt, in Melbourne. Tenders were called for the pasteurization, bottling and delivery of the milk, and the Willsmere Certified Milk Company secured the tender.

The difficulty of keeping even pasteurized milk in a sound condition for twenty-four hours in our hottest weather, and the realization that want of proper provision for storage of milk in the home has been a very important factor in the causation of summer diarrhœa of artificially-fed infants, determined the Board to attempt to improve on the systems elsewhere in vogue by providing and maintaining small ice chests and an adequate supply of ice in each house to which milk was delivered. An appeal was made in the press last Christmas, and a generous response on the part of the public enabled the Board, at a cost of 7d. a week, to keep an ice chest with ice in each house to which the milk was delivered. The ice chests were devised by the Board, and from their simplicity and inexpensiveness will, it is trusted, come into more general use. Blocks of ice were supplied with the milk each morning by the Willsmere Company. This innovation proved a great success, the milk keeping excellently except during one very hot week, when the ice supply was found to be inadequate, and the blocks had consequently to be increased in size.

In order to explain the objects of the Institute, Drs. Norris and A. Jeffreys Wood waited by appointment on the Councils of Collingwood, Fitzroy and Richmond, and briefly detailed to them the steps that had been taken, and the results that the Board hoped to attain by the distribution of a clean, safe milk among the poor of the various municipal districts. The reception accorded to the delegates was most cordial, and the result



INTERIOR OF BOTTLING ROOM (WILLSMERE CERTIFIED MILK COY.).

of the information was that the Collingwood Council voted £150 to the Institute, Richmond £100, Prahran £50, and Fitzroy £20. Such ready and hearty co-operation on the part of the Councils was most gratifying to the Board, and it is trusted that this movement will meet with the hearty approbation of the ratepayers, being, as it is, one of the best uses of the city funds to keep sickness and death out of the families of the poor.

A meeting of medical men practising in the city districts was called by the Board; the objects of the Institute were explained to them, and their active co-operation and assistance were asked for and obtained.

Two nurses with experience in the nursing of infants were engaged by the Board to visit all houses to which the milk was distributed. Each child was visited and weighed by a nurse at least once a week, and in case of sickness the children were seen sometimes twice a day. The excellent work done by the nurses in inculcating habits of cleanliness and fresh air in the various homes that they visited will be of lasting benefit, and the Board feels that this phase of the work of the Institute is of almost equal value to that of distributing safe milk. Every effort was made by the nurses to encourage mothers to nurse their babies, and many children were kept on the breast, instead of being weaned during the hot weather, as the result of the nurses' advice.

A small booklet drawn up on the lines of that issued by Dr. Goler, in Rochester, U.S.A., was distributed freely amongst the poorer families of each district, and judging from the reports of the nurses, proved of very great value to the mothers, and through them to the infants. The directions given are simple, and if generally followed would considerably improve the lot of the average baby. The Board would suggest that the Government of Victoria should print this booklet, to be given to every parent who registers the birth of a child.

Application forms for the milk were issued by the Board to be filled up by medical men, and on receipt of these signed forms the Chairman of the Board instructed the company to deliver an ice chest and milk to the address given on the form; the nurse was at the same time directed to visit the house and make a report as to the general surroundings, also to instruct the mother as to the proper method of attending to the ice chest, the milk, and the feeding bottles. The nurse also reported as to the means of the family, and, when necessary, an order was made to deliver the milk free of charge. In most cases, however, the parents were sold coupons at the beginning of the week by the milkmen, and a coupon was left for the milkman to collect as he delivered the milk in the morning. The coupons were made up in sheets of 14 (two rows of 7), each coupon representing one pint of milk, so that a sheet would mean a week's supply of one quart daily, or a fortnight's supply of one pint daily. The price paid by the Institute to the Willsmere Company for the milk, pasteurized, bottled, sealed with paraffin wax, and delivered, was 4d. a pint, and the price paid by the parents was on an average 2d. a pint. The sealing with paraffin wax of all bottles was insisted upon by the Board as being the only method by which the Board could insure the detection of any tampering with the milk after it left the company's depôt.

The Board fully recognised the fact that dairies cannot produce specially supervised milk without additional expense, and feels sure that the general public will realize this fact, and readily respond by paying the necessary advance on the general price of milk for a safe, pure milk for infants.

At the beginning of January, 1909, the Institute commenced its distribution of specially supervised milk in the metropolitan area, concentrating its efforts chiefly in those municipal districts the local councils of which had promised financial aid. Every approved case applying for the milk was supplied until June, when the Board suspended the supply of milk in order to conserve its remaining funds, it being realized that the vital value of such milk would be much greater during the coming summer.

During the five months the Institute was distributing milk 39,594 pints were distributed amongst 294 families, at a cost of £659 18s. for milk and £74 11s. 6d. for ice. The total amount received for the milk from those supplied on a philanthropic basis was £197 5s. 7d. The milk was delivered chiefly in wide-necked pint bottles stamped with the registered design of the Institute and stoppered with paraffined compressed paper wads, over which sterilized paraffin wax was placed to guard against removal of the wad before delivery.

About 300 infants were supplied with milk by the Institute, and of these only eight died, a record that the subscribers to the Institute may well feel proud of, especially when it is remembered that a large majority of the infants when first put upon the milk were already suffering from diarrhœal troubles due to the defective milk supplied to them during the summer months prior to the commencement of the Institute's supply. It is the earnest desire of the Board that it will receive such support this year as will enable it to supply the milk before the commencement of the summer proper, and thus anticipate and prevent diarrhœal diseases amongst the infants of the poorer districts of the city instead of having to overtake and cure them.

The Government Statist's returns of deaths of infants under twelve months (excluding those in hospitals and public institutions) in the metropolitan districts for the first six months of 1909 are most encouraging, and the Board looks forward to still better returns being demonstrated next year, if funds are provided to enable it to supply milk during the whole year, or at least throughout the whole summer.

TABLE I.

1.—Deaths of Infants under twelve months of age (excluding those in Hospitals and Public Institutions) in Districts in the Metropolitan area during the first six months of each year.

	1906.	1907.	1908.	1909.
Melbourne	134	95	110	89
Fitzroy City	63	35	51	38
Collingwood City	48	35	42	31
Richmond City	42	42	47	34
Brunswick City	50	35	33	40
Prahran City	37	39	40	32
South Melbourne City	44	34	41	50
	418	315	304	314

TABLE II.

2.—Number of cases supplied by the Institute.

	Cases.	Deaths.
Melbourne	48	0
Fitzroy City	26	2
Collingwood City	79	3
Richmond City	74	1
Brunswick City	11	0
Prahran City	37	0
South Melbourne City	19	2
	294	8

In Collingwood the average number of infants dying under twelve months for the past three years has, during the first half of the year, been 41.6. During the first half of this year only 31 deaths occurred under twelve months, the lowest number recorded for many years. If the Board had been able to supply milk from the previous November, many of these deaths would have been prevented. In the city of Melbourne, exclusive of hospitals, the average number of deaths under a year old for the first half of the past three years has been 110; this year only 89 deaths occurred, the lowest figure yet reached. In Prahran the average has been 38.6, whereas here again the lowest figures have been obtained this year, only 32 infants dying under twelve months. In Richmond the average number of deaths for the first half of the past three years has been 43.6; this year only 34 infants died. In South Melbourne the number of infants dying under twelve months in the first half of this year was 50; the average for the past three years has been 39.6. The Board hopes that during the ensuing summer the South Melbourne Council will co-operate with it and endeavour to reduce this waste of infant life.

In Melbourne and the suburbs over 1,200 infants die each year. The Board feels confident that if it receives generous support in its work from the councils, the various charitable trusts and the public, it can save at least 300 of these lives, besides helping the coming generation of children to far healthier constitutions, and at the same time improving the surroundings in the poorer homes.

The Australian-born infant must always be looked upon as the best immigrant for the State, and as a community we must condemn ourselves for neglecting to prevent this preventable waste of infant life. The members of the Board have not spared themselves in working up the details of this life-saving work, but their efforts will come to naught unless they meet with a very active response from the Government and all those in whose power it lies to give them substantial assistance. The payment of a secretary and nurses for the ensuing twelve months will alone exhaust the Board's present funds, leaving nothing available for the milk or its distribution.

SANITARY METHODS ADOPTED AT FARM

The special provisions that have been carried out at the farm towards obtaining milk free from disease-producing germs and other forms of deleterious contamination, have included means for insuring:—

(*a*) The freedom from tuberculosis, and the continued maintenance of the healthfulness of the herd;

(*b*) Sanitary construction and cleanly maintenance of the premises and surroundings in which the cows are milked;

(*c*) Especial care in connexion with the milking; and

(*d*) Special treatment and handling of the milk while on the farm premises.

HEALTH OF HERD.—The whole of the cows in the herd, prior to the use of the milk for Institute purposes, were tested with tuberculin by a Government veterinary officer for tuberculosis. Two re-acted to the test, and were immediately removed from the herd. All the cows that have been introduced since have been purchased subject to the tuberculin test, and only non-reacting animals retained. Careful manual examination of the udders of all the cows has been made at frequent intervals, and this

infection of the udder by the Institute's Bacteriologist (Dr. Bull), any cows showing such infection being immediately rejected for the supply of Talbot milk.

MILKING SHED AND SURROUNDINGS.—The impervious floor of the milking shed is constructed of brick, grouted with cement, and graded in such form as to be easily and quickly flushed with water and to carry off any byre fluids. The shed is open on one side, and the perflation which this allows of, results in complete freedom from all stuffiness and the obnoxious smells usually to be observed in cow-sheds. The open side of the shed faces the east, and is so constructed as to allow of almost complete insolation with the morning sun. The holding yards at the end and back of the milking-shed are paved with stone pitchers, and there is no unpaved surface on any side of the shed which is unprotected by other buildings from the wind, so that the dust nuisance is reduced to the minimum degree possible with an open shed. A separate feeding shed is provided along the front of the milking shed, and the cows, after being milked, pass from their bails through doors in front, to be fed in the stalls of the feeding shed. This arrangement of separate feeding and milking sheds—apart from enabling quicker progress to be made with the milking of the herd—has the great sanitary advantage that the milking shed is kept free from the dust, débris, taints and smells always associated with manger feeding. There is no food débris to attract flies into the milking shed, and furthermore, the cows while being milked are not in that excited state which is usual when milking and feeding are carried on at the same time. The other buildings comprise cooler rooms, a utensil storage room, a wash-up shed in which is the utensil sterilising plant, boiler house, and a machinery room. All these buildings have brick floors, and are otherwise sanitarily constructed, the rooms in which milk is handled having their openings protected by fly wire blinds and doors.

MILKING METHODS.—The cows have been machine-milked throughout the whole period of supply. All the cows' udders are clipped bare of hair. The tail, rump and quarters are cleansed whenever soiled. Before each milking, the udders and teats are washed with warm water and dried, the water being changed between each cow, and oftener if required. Before the machines are applied, the first milking of each quarter to the amount of three or four squirts (about 2 oz.) is milked by hand into a special bucket labelled "Rejected Milk." The milker's hands are thoroughly washed with warm water and soap before commencing the removal of the fore milk or affixing the machines. Each milker or attendant is supplied with clean washable overalls, which are worn during the whole of the operations—both during milking and the subsequent treatment of the milk.

HANDLING OF MILK.—As each pair of cows is milked the milk of each is weighed separately and the amounts recorded. The milk is at once carried across to the cooling room—a distance of 15 to 20 feet—and emptied into a funnel strainer connected with a vat, from which it passes to the centrifuge (milk-cleansing machine). After passing through this machine, the milk passes over two Lawrence coolers. The first of these is operated with well water, and reduces the temperature of the milk to about 60 deg. The second cooler is operated with refrigerated brine, and the milk on passing over this is reduced to a temperature of 35 degrees as it enters the transport cans. These cans are provided with ice-floats, whereby the low temperature is maintained, and the milk is usually delivered to the contractors at their City Depôt in Bourke-street at a temperature of about 40 degrees.

SUPERVISION OF OPERATIONS.—During the whole of the period of supply, the farm, the stock, the milking methods, and the handling of milk have been under the almost constant supervision of an Officer of the Dairy Supervision Branch of the Agricultural Department. During the early weeks of the inauguration of the supply an Officer of the Board of Health was continually in attendance while milking operations were being conducted, and while the milk was being prepared for transport. Later on, it was found possible to moderate this rigid control, and the officers concerned were only required to be in attendance intermittently. On two separate occasions, for a period of a fortnight each, when special tests were being carried out, a Dairy Supervisor from the Agricultural Department, specially qualified as regards the use of milking machines and the handling of milk, was placed in complete charge of the operations on the farm. The improved results, as regards wholesomeness of the milk, of this expert control as compared with ordinary management will doubtless be fully indicated in the report of the Bacteriologist.

NURSES' REPORTS FOR 1909.

NO. I.

From January until June, 1909, I visited each child who received the milk (with the exception of two or three older children) at least once weekly; those who were really "sick babies" I saw much oftener—two or three times weekly—and during the acute stages of their illness going when possible every day, and in one or two cases twice daily.

One both hears and reads a great deal of how present-day parents neglect their children, but I have come across only one case of sheer, callous neglect, and I have come to the conclusion that most of the seeming neglect is due either to absolute ignorance or in many cases to physical incapacity on the part of the mothers. I think much might be done by teaching these young mothers a few simple facts with regard to infant feeding. And here I would like to say that I consider the small pamphlet printed by the L.T.M.I. has done an inestimable amount of good, and if I might venture to make the suggestion that should any new copies be printed a short diet list for children from one to two years of age would be a most helpful addition.

It is among these older children only that I have found the milk has not always been put to the uses it should, and I would advise that each case should be most carefully inquired into before being put on to Talbot Milk. This, I think, applies especially to those children over nine months old.

Again, it is worthy of consideration that one is frequently told by the poorest (and usually the proudest) of these mothers that for three months before their babies were born they lived on dry bread and black tea. This is no exaggeration whatever, and though, undoubtedly, the various benevolent societies are doing excellent work in this direction, there is still very much to be done.

I believe that next year the delivery of the milk is to be undertaken by different milkmen in the various suburbs. Should this be so, might I offer the suggestion that at some central spot in each suburb a few bottles of milk should be left daily, so that an accident such as the breakage of a bottle, either by the deliverer or the recipient, could be easily remedied. In spite of the many difficulties that always surround a new project, I think the L.T.M. Institute may be more than satisfied

with the good work it has done in this its first year, and there are many mothers who would tell one that they owe their babies' lives to Talbot Milk. Next year I am convinced that the applications for the milk will be at least doubled, and the good work of the Institute far more widely spread; and surely this should be so.

I know the expenses are very heavy, but I cannot help feeling that if a subscription list were opened the public would nobly respond; not only would the wealthy send their cheques, but, was it widely enough known that the money was needed, the poorer classes would send in their shillings and half-crowns in great numbers. Again, I think no milk should be delivered absolutely free of charge—even if only a halfpenny a week could be afforded I think that halfpenny should be paid. I say this with all earnestness, simply from what I have observed during these months.

While speaking on the money question, I would like to say, on a strictly impersonal basis, that I think it would be the very greatest mistake for the nurses who visit the children to be in any way connected with the selling of the coupons or the taking of the money. Once let the people think the nurses go for any reason other than to sympathize and look after the welfare of the baby, and to my mind every shred of influence they may have will be irrevocably lost, and the cry will be changed from "Here comes Nurse to see Baby!" to "Here comes the woman for the milk money!" and one can hardly expect these poor overworked mothers to take counsel and advice from "the woman who comes for the money." I would like to say a few words as to the way in which I have been received at the many and various homes I have visited. In no case have I met with anything but courtesy, and I must admit that this was a surprise to me. I expected to be "tolerated," and found that in most cases I was welcomed and eagerly looked for, and in several cases where the babies have been seriously ill I cannot say enough in praise for the constant and devoted nursing they have received from their parents. All I have to say in conclusion is: May the L.T.M. Institute increase its good work each year, and prosper exceedingly.

BRISEIS BELSTEAD.

No. II.

It is now just four months since I first started visiting the babies fed on the L.T. Milk in the districts of Richmond, Prahran, and South Melbourne. In all I have had in my care 120 babies.

Of these two died in Richmond. One had been on the milk for twenty-four* hours only, and was very emaciated with marasmus. The other baby had the L.T. Milk for one week. He had been ill for weeks with bowel trouble, and could not take any food. Even the L.T. Milk did not agree with him. He was put back to whey and brandy, and died a few weeks later.

Three in South Melbourne—one from neglect; just skin and bone when we first found her. One from heart failure—a miserable little thing, on the L.T. Milk nine days; and one baby who was having the L.T. Milk for eleven days, aged three weeks. The babies who have been fed on L.T. Milk exclusively under eight months of age, show the greatest improvement of all. One child in Prahran, fed on the L.T. Milk pure, and an occasional rusk, gained 8½ lbs. in four months.

* In estimating the number of cases supplied, and the deaths, those children who have not been on the Institute Milk for at least 7 days have not been counted.

The sorrow caused to the mothers by taking their babies off the L.T. Milk is a good proof of how much they appreciated all that had been done for them and their babies.

It has been rather uphill work trying to teach and unteach many of them, but I think now the good work has been started we may hope for even better results next year.

There have been no complaints in my districts about the L.T. Milk for some time past, and everything has been quite satisfactory.

A. M. Ingram.

Conclusion.

In conclusion, the Board acknowledges with grateful thanks the valuable assistance rendered by the Health Department and the Stock and Dairy Supervision Branch of the Department of Agriculture; the work done by the officers of these Departments has been simply invaluable to the Board. The Board also gratefully acknowledges the assistance it has received from the directors and manager of the Willsmere Certified Milk Company, who have spared no trouble in carrying out the wishes of the Board, and to whose enthusiastic co-operation the success has in no small part been due.

Caulfield Model Dairy Farm—The Approved Farm.

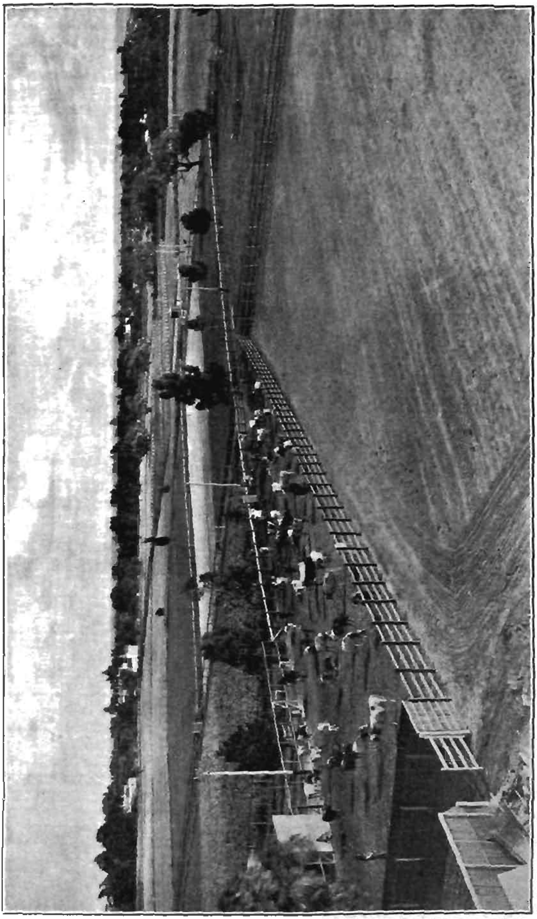
J. M. B. Connor, Dairy Supervisor.

The public spirited citizens of Melbourne who have been the means of establishing the Lady Talbot Milk Institute, having for its object a pure and healthful supply of specially supervised milk for delicate infants, have every reason to be satisfied with their enterprise and with their success in obtaining, so early, a milk supply produced under the satisfactory conditions obtaining at the farm of Mr. George H. Hope, situated at Caulfield.

Great as may be the public service performed by the Lady Talbot Institute in distributing this supply of pure nourishment to poor and delicate children, the indirect benefit of its example and precept in encouraging the establishment of such farms as the one under review is not less valuable. Owing to the large number of practical farmers and dairymen who have visited the premises during the last six months, it may reasonably be hoped that the standard of the bulk milk supply to the city will be raised by this example. Certainly, an object lesson has been furnished by Mr. Hope, and he has been able to show that the standard conditions, as to sanitary management, laid down by the Institute, can be complied with consistently with profit making. The encouragement and development of milk farms similar to this one would certainly have an appreciable effect in diminishing the rate of infant mortality in the cities.

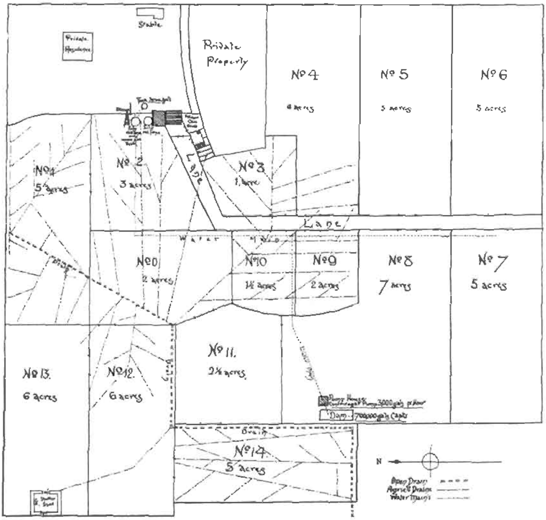
The Farm Generally.

The farm comprises 63 acres, and is sub-divided into 14 paddocks, varying in size from 1 to 7 acres. Most of the paddocks open into a 30-feet lane running through the middle of the property, which makes it convenient for the distribution of the dairy herd for grazing, and also for the removal of crops into the barn. Each paddock gate is painted white and numbered. Fifty-three acres are under intense cultivation and rotation of fodder crops throughout the year. Seven acres are used as a run for the dairy herd.



1. GENERAL VIEW OF THE CAULFIELD MODEL DAIRY FARM.

The improved methods of cultivation and rotation of crops adopted on this farm, on the advice of officers of the Department of Agriculture, are forcibly demonstrated by the heavy yields of fodder crops grown; particularly when it is considered that the soil is of a white sandy nature, and, in its virgin state two years ago, was covered with a dense growth of bracken fern. It was then not fertile, but its mechanical condition facilitates cultivation at all periods of the year, and by applying suitable manures it responds readily with payable yields of fodder crops.



2. GROUND PLAN OF PADDOCKS, SHOWING SYSTEM OF SUB-DIVISION.

The method adopted in clearing the bracken fern, was to plough (some 14 inches deep), getting below the roots, three horses being used in a single furrow plough. After harrowing, the roots were raked into heaps and burned. Continuous cultivation has since kept the paddocks free from further growth of bracken.

To successfully work such a farm as this it is necessary to have some system. Many farmers lack system in their operations. This is often due to pressure of work, to want of foresight in planning, or to the careless conception of requirements by the owner. Mr. Hope has a system and follows it, always planning ahead, and thereby keeping the farm operations up-to-date.

TILE DRAINAGE.

Some 20 acres have so far been drained with 3-inch tile drains. The advantages to be derived by draining this sandy land are apparent by the

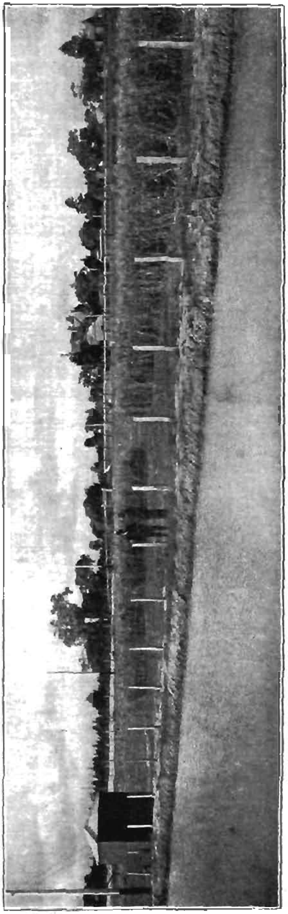
luxuriant crops grown. A comparison of those paddocks drained (as indicated by black irregular lines on the ground plan of farm, page 556), as against those undrained, shows a wonderful difference in growth. It is Mr. Hope's intention to drain the balance of the farm in the immediate future.

The aim is to produce as much fodder as possible by intense culture, and systematic rotation of crops, aided by farmyard and artificial manures and irrigation. Past experience points to the possibility of being able to carry two cows to the acre, if a certain quantity of concentrated foods, such as bran, oats, corn meal, &c., is purchased to supplement the farm grown crops.

IRRIGATION.

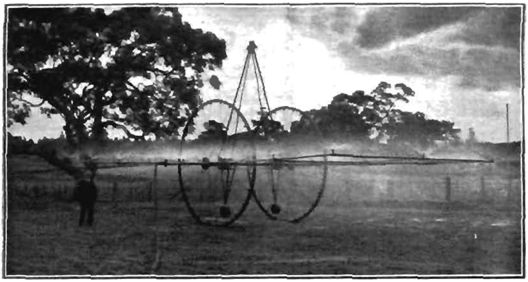
A dam is constructed in the lowest portion of the farm. This was originally an old water hole of solid clay. It was excavated some 8 feet and the contents used for building a 4-feet wall thus giving the dam 12-feet depth. The capacity of the dam is 700,000 gallons.

Alongside the dam, there is a small house containing a 5 h.p. electric motor, and a small centrifugal pump, by which 4,000 gallons of water per hour are pumped into the tank on the top of the silo, about 20 chains away. The supply tank is of 19,000 gallons capacity and from it a 3-inch main distributes the water for irrigation purposes all over the farm. Taps are fixed at convenient intervals, and the methods of irrigation vary according to the requirements of the crop grown. Secondhand fire-brigade hose is used so that the water can reach the farthest point required from the



3. VIEW OF DAM, 700,000 GALLS. CAPACITY.

principal water main. An ingenious invention of Mr. Hope's, in the way of a very fine spray or sprinkler, is shown in one of the illustrations. It will water, in the still atmosphere, 1,200 square feet; equal to 1½ inches of fine rain per hour over that area. The sprinkler is built of iron, and can be balanced to any angle required by two suspending iron weights. It is connected with the main pipes by means of a hose.



4. SPRINKLER IN OPERATION.

A bore was sunk on the highest point on the farm, and at 100 feet depth, first-class water was obtained. The supply is conveyed by pipes to properly constructed water troughs in the various paddocks, thus insuring for the cows an abundance of pure water.

GROWING CROPS.

The various paddocks on the farm at the time of writing (1st July) are sown with the following crops, viz.:—

Paddock No. 1.—Sown 3rd April, 1 acre Bonanza oats, at the rate of 2 bushels to the acre; 5 acres, mixed crop of oats, 1 bush., barley 1 bush., tares ½ bush. Manured with a light dressing of stable manure, and blood manure at the rate of 120 lbs. per acre.

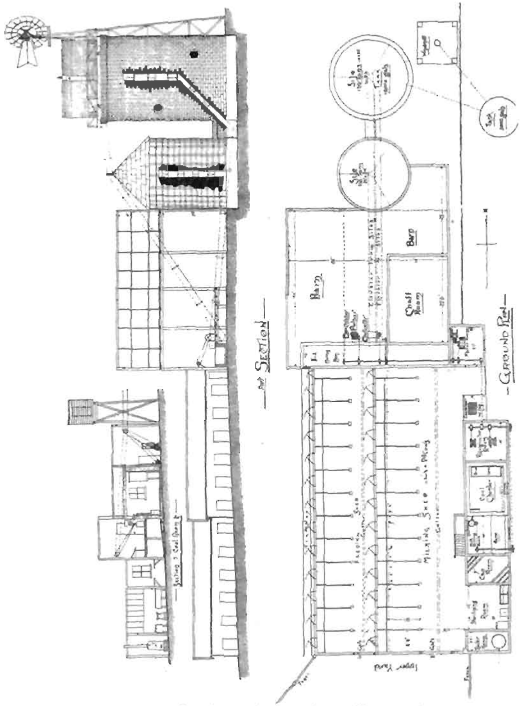
Paddock No. 2.—This paddock has been ploughed, at intervals, three times, viz., 3 inches deep, 6 inches and 9 inches respectively. It was harrowed three times, and allowed to lie idle for two months. On the 21st April it was sown with 1 bush. black oats, 1 bush. barley, ½ bush. rye, ½ bush. tares, per acre. Manured at the rate of 3 cwt. mixed manure per acre.

Paddock No. 3.—Sown on 10th June with a mixture of tick beans, Storm King oats, and barley, and has just had a heavy crop of maize harvested off it. Manured with light dressing of stable manure and 2 cwt. of superphosphate per acre.

Paddock No. 4.—Ploughed 10 inches deep, and allowed to lie idle for two weeks; 3 acres sown with 2 bush. per acre of a mixture of white oats, tares, rye and barley. Manured at the rate of 2 cwt. blood manure per acre, and a light dressing of stable manure.

Paddock No. 5.—Ploughed 9 inches deep. Sown with a mixture of Bonanza oats 1 bush., tick beans ½ bush., peas ½ bush., and barley, 1 bush. per acre. Sown 26th February, 1909. Manured with 1 cwt. superphosphate, and ½ cwt. sulphate of ammonia per acre.

Paddock No. 9.—Ploughed 9 inches deep, harrowed and cross-Ploughed 9 inches deep, manured with stable manure and 2 cwt. blood manure to the acre, and sown with the following mixture:—One bush. N.Z. black oats, 1 bush. barley, ½ bush. tick beans per acre.



5. GROUND PLAN OF MILKING AND FEEDING SHEDS, AND SECTION OF REFRIGERATOR ROOM, SILOS, AND BARN.

Paddock No. 7.—Ploughed 9 inches deep. Harrowed, cross-harrowed, rolled, and sown on 29th April with a mixture of black oats, rye, tares, and barley. Manured with 2 cwt. superphosphate per acre.

Paddock No. 8.—Ploughed 10 inches deep, harrowed and cross-harrowed and rolled. Sown on 26th March with black oats, 1 bush., and rye 1 bush. Manured with 2 cwt. blood manure to the acre.

Paddock No. 9.—Ploughed 9 inches deep, harrowed and cross-harrowed twice and rolled. Sown on 26th February with a mixture of stout white oats, rye, tares and barley. Manured with 3 cwt. blood manure and a light dressing of stable manure.

Paddock No. 10.—Half of this paddock was ploughed 10 inches deep, harrowed four times, cross-harrowed and rolled. Sown on 10th September, 1908, with lucerne in drills, at the rate of 7 lbs. of Hunter River seed to the acre. This crop has done remarkably well, and has returned four cuttings since sown. The balance of this paddock was sown with lucerne on 15th March, and at the present time is looking well. During the coming spring, 15 acres additional will be put under this valuable fodder crop.

Paddock No. 11.—Ploughed 10 inches deep, harrowed twice, and cross-harrowed. Sown on 24th April with a mixture of Algerian oats 1 bush., rye ½ bush., tares ½ bush., and barley 1 bush. Manured with 1 cwt. blood manure and 2 cwt. superphosphate per acre.

6. MILKING AND FEEDING SHEDS.

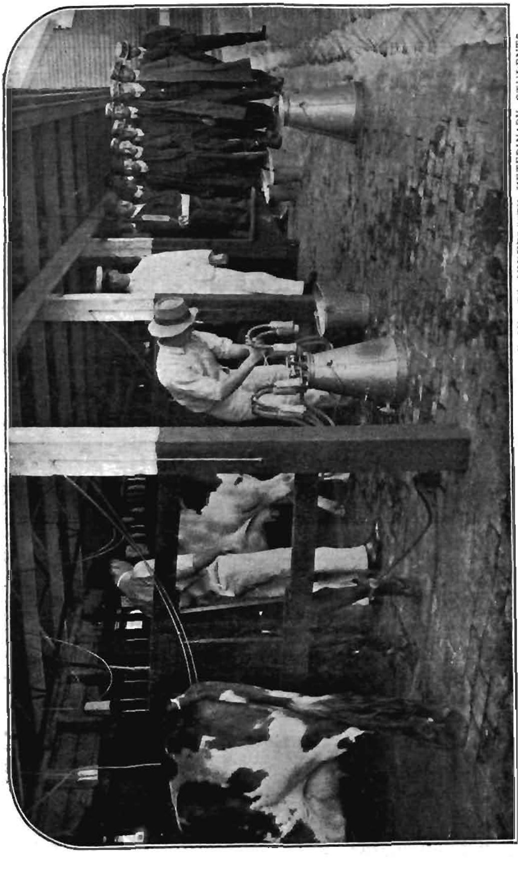
Paddock No. 12.—Three acres sown on 12th March with mixture of black oats, rye, tares and barley; 3 acres sown same day with Bonanza oats at the rate of 2½ bush. per acre. Manured with 1½ cwt. blood manure per acre.

Paddock No. 13.—Ploughed 10 inches deep, harrowed twice and cross-harrowed and rolled. Sown on 6th March with black oats 1 bush., barley 1 bush., rye ½ bush., tares ½ bush. per acre. Manured at the rate of 1 cwt. blood manure per acre.

Paddock No 14.—Treatment of land manuring the same as paddock No. 13. Sown on 23rd March, with 2 bushels of Bonanza oats per acre.

THE MILKING AND FEEDING SHEDS.

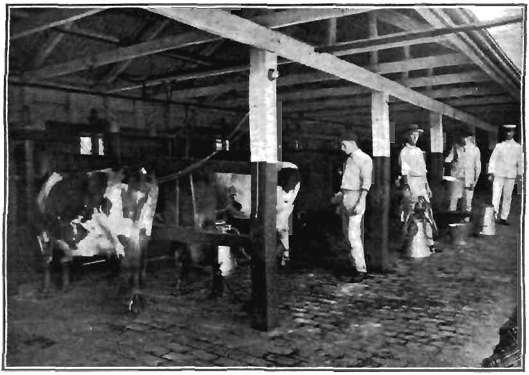
The buildings form such an important feature in the sanitary production of a pure and wholesome milk supply that they merit description.



7. MR. S. S. CAMERON, M.R.C.V.S., LECTURING ON SANITATION TO UNIVERSITY VETERINARY STUDENTS.

The milking and feeding sheds are separate as shown in the illustrations on pages 559 and 560. The roofs are so constructed as to allow the morning sun to have full play into them. In both cases the floors are well bricked and impervious with a sufficient fall to carry off the drainage. The milking shed contains 12 double bails, each bail being 6 ft. 6 in. in width, thus allowing 24 cows to be bailed up at one time.

When the first batch is milked a door is opened at the head of the bail, through which the cows move directly across a small passage into the feeding shed, exactly the same size as the milking shed. Another batch of 24 cows is bailed up in the milking shed, and by the time this batch is milked, the original 24 have had their feed, and are passed out through the door at the head of the bail, into the paddock. The second batch then occupies the feeding shed until a third batch is milked and ready to be fed.



8. THE MILKING SHED, WITH L.K.G. MACHINES IN OPERATION.

When the photograph was taken, the three boys in the foreground were undergoing a fortnight's instruction in cleanliness and sanitation by Mr. W. H. Clowes, Dairy Supervisor, who is standing in the background.

The advantages of a separate feeding shed are many. In the first place, it enables a large number of cows to be milked in a comparatively small shed, as there is continuity of operations, one batch after another being milked and fed without any inconvenience. Another advantage is that the cows are less excited when milked without being fed, and let down their milk better. A further great advantage in connexion with the main object of a pure and wholesome milk supply, is that there is no smell to taint the milk, and consequently nothing to attract flies in the milking shed, as the flies follow the feed. The bins in the feeding shed are so constructed that the cows cannot waste their food.

Water is laid on at different points throughout the two sheds, and the system of cleaning and construction is such that there is an entire absence of the obnoxious odours present in the large majority of milking sheds in general use. The cows droppings are removed after each shed is milked.

The abundance of sunlight and fresh air that has free access at all times to these buildings tends to keep them sweet and free from undesirable bacteria that require certain insanitary conditions to live.

COOLING CHAMBER, CENTRIFUGING ROOM, ETC.

This is shown in illustration No. 5 (section of cool room), and also on the right hand side of photograph No. 6.

In the room adjoining the cool chamber an Alfa Laval Centrifuge is installed; this room and the next one (can room) are both dust-proof and fly-proof. Alongside the can room is the wash-up room fitted with vats, steam jets and connexions. In this room is the steam chest (sterilizer) where all the metal ware, coolers, cups of milking machines, and such like are sterilized twice daily. The steam jets are used for steaming milk cans, buckets and the like.

The walls of this chamber are surrounded by sealed air spaces, and are packed with non-conducting substances, to prevent the heat being absorbed. Brine is circulated through a series of coils suspended in a large tank, within the chamber: ammonia is employed to reduce the brine to a very low temperature. The water for cooling the condenser is kept cool by means of a louvre tower as seen in photograph No. 5. Ice is also stored in the chamber.

The rubber-tubing of the milking machines is boiled for 15 minutes after use, and then immersed in limewater until next milking.

Adjoining this room is the boiler room containing a one h.p. boiler, which is used for cleaning and steaming purposes. In the event of a breakdown in the electric system, this small boiler is used as a motive power for driving the milking machines. On the north side of the cool room is the machinery room, containing two small De Lavergne refrigerators, each of 5 cwt. ice capacity. These machines take 1½ h.p. to drive the two of them. The two buildings have brick floors with requisite fall.

A complete plant has recently been erected for bottling all milk on the premises, and a Wickham's Patent Bottle Washer and Soaker installed for washing and sterilizing the bottles before use.

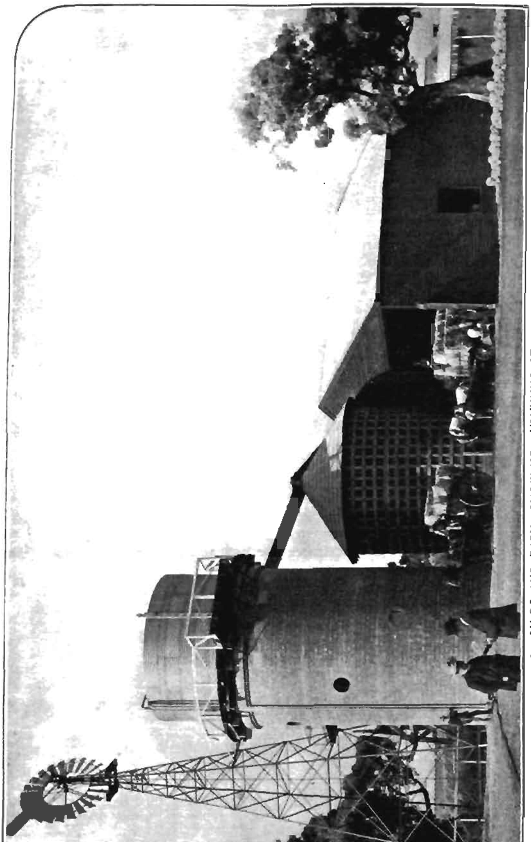
THE FODDER BUILDINGS.

Photograph No. 9 shows the exterior of the barn, and No. 10 the interior, with men chaffing maize, crushing oats, and pulping pumpkins from the stored heap outside the barn, their operations being carried on alongside a long feed mixing brick pit.

An elevator, as seen in the view, runs through underneath the chaff-cutter, and the fodder that is intended for silage falls directly into the elevator, and is carried into either silo as required. The chaffcutter is a 3-knife machine capable of cutting 6 tons of green material per hour. Oaten hay or oaten chaff, which is used in the formation of a balanced ration, is chaffed and falls direct into the mixing pit. For storage purposes, the chaff is delivered by the elevator into a tin-lined chaff room capable of holding some 35 tons. The advantages of this method of storage are that the room is vermin proof, and that vermin cannot live in the midst of the loose chaffed material. The chaff room has doors leading direct into the feeding bin.

The pulper is used for crushing and pulping pumpkins and all kinds of root crops grown on the farm. Pulped mangolds and carrots are regularly fed to the cows, and give good results.

The grain crusher is used for crushing barley, wheat, oats and such like grains used in the daily ration as concentrated foods. A watchful eye is always kept by the owner as to market values from time to time, and whatever offers the best value from a nutritive and commercial standpoint is bought. The barn is sufficiently large to hold a twelve months' supply of hay, straw and concentrated foods.



9. SILOS AND BARN, SHOWING PUMPKINS STORED IN FRONT.

Portion of the barn floor is pitched for the purpose of enabling full loads of feeding stuff to be carted right into the barn and alongside the chaffcutter, thus facilitating labour when handling the green forage crops intended for silage. It will be observed from the plan of the buildings that the silos and barn are close to the feeding sheds. A tram line runs

10. INTERIOR OF BARN—CHAFF-CUTTER, PULPER, AND CRUSHER AT WORK.

along the side of the feeding shed, and is connected with the feed bin by a door through the wall; thus the feed when mixed ready for use is thrown through the doorway direct into the trolley and conveyed by the tram line to the feed boxes.

STABLES AND NIGHT SHELTER.

The stables are close by the other buildings. Three draught mares of good type are continuously in use on the farm. Detached stables for housing two pure-bred Ayrshire bulls, with exercise yards, are in close proximity.

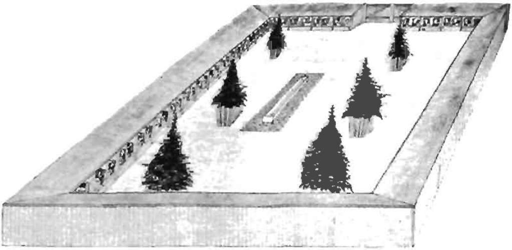
The shelter shed in paddock No. 13 is naturally well protected from the prevailing winds, which come from the north and south-west. The shelter shed is built round four sides of a square each side 200 feet long, or 600 feet in all. It is 10 feet in width and 7 feet high, with iron roof. The rain catchment is diverted into tanks, which in turn feed a drinking trough in the centre of the courtyard.

The shed floors are of brick, and are raised 6 inches above the surface level of the yard so as to form a platform stand for the cows. This platform is divided by wooden framework into 124 stalls with feed trough at the head so providing accommodation for feeding and housing the herd throughout the year, and also giving facilities for properly conserving the solid and liquid manure.

THE DAIRY HERD.

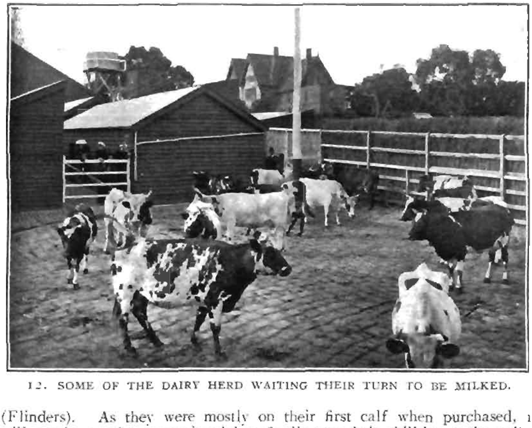
Photograph No. 12 shows some of the dairy herd in the receiving yard, waiting to be milked. It will be seen from this picture and from photograph No. 13, which represents the whole of the dairy herd, that the Ayrshire breed is strongly predominant in the herd. It is Mr. Hope's intention to have nothing but pure-bred Ayrshire cows in the near future.

Every cow's milk is weighed and tested, and the "duffers" will be ultimately rejected, and replaced by young cows to be again culled after



11. SHELTER SHED.

proof at the pail. Most of the present herd have been purchased from the well-known Ayrshire herds of Messrs. McIvor (Seymour), F. J. Stansmore (Pomborneit), Brisbane (Camperdown), and Buchanan



12. SOME OF THE DAIRY HERD WAITING THEIR TURN TO BE MILKED.

(Flinders). As they were mostly on their first calf when purchased, it will require another season's trial to finally test their abilities at the pail.

MOTIVE POWER.

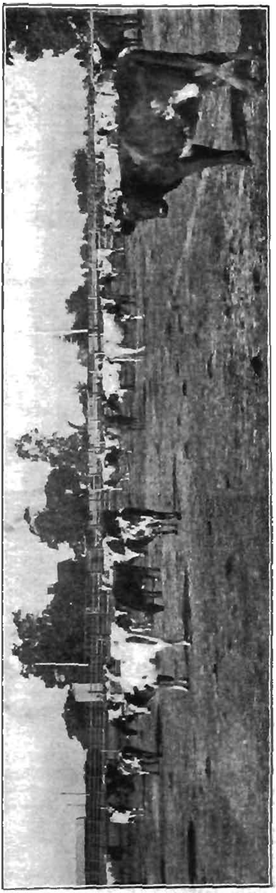
All machinery on the farm is driven by electricity supplied from the Electric Lighting and Traction Company of Australia, a 7-h.p. motor being used. As the cost is 2d. per unit, Mr. Hope finds it much cheaper than any other power.

THE SILOS.

Photograph No. 10 shows a combined brick silo and tank stand. The silo holds 150 tons of silage, and the tank 19,000 gallons of water. The second silo in this photograph is built of wood and iron, and has a capacity of 110 tons. Both silos are divided into three compartments, 4 in. x ⅝ in. T. & G. blue gum hardwood being used for the partitions.

There is a triangular chute or chimney (see No. 5) in the centre of each silo, which is connected by a series of doors with each of the three compartments. The silage is emptied from the different levels through these doors, from which it falls to the bottom on to an underground elevator. This elevator empties both silos, carrying the silage to the mixing pit. This simple contrivance is a great labour-saving appliance as a boy can empty both silos by this means. If the silage is required for distribution in the feeding paddocks, it can be emptied through a series of doors, as shown in the photograph, into a dray below, and carted wherever required. This year the iron silo has been filled and the brick silo (only completed recently) partly filled. There are enough crops coming to maturity on the farm, at the present time, to fill both silos in the spring.

In hand feeding, an attempt is being made to study the requirements of each individual cow; and from the knowledge gained fixing what ration each cow will require, according to the quantity and quality of milk obtained. The nutritive requirements of cows vary as their lactation progresses Their needs cannot be satisfactorily supplied by



13. THE MILKING HERD OF AYRSHIRES.

work. It has also been found advantageous to vary the ration according to the yield of the cows, a fuller ration as regards quantity and quality being given to the heaviest yielders. At the present time the following rations are being fed:—

ANALYSIS OF RATIONS.

	Weight.	Water.	Protein.	Carbo-hydrates.	Fat.	Total Digestible.
No. 1 Ration.	lbs.					
Green Crop	40	31·72	·52	4·72	·16	5·40
Silage (Maize)	35	27·69	·28	4·06	·21	4·58
Lucerne Hay	5	·42	·51	2·07	·05	2·63
Oaten Hay	5	·44	·21	2·32	·08	2·61
Bran	5	·60	·63	2·20	·14	2·97
Oil Cake	2	·18	·44	·95	·24	1·63
Oats (Crushed)	2	·22	·18	·89	·08	1·15
Malt Combings	1	·09	·20	·36	·02	·58
	95	61·36	2·97	17·57	1·01	21·55
	Nutritive ratio, 1 to 6·7.					
No. 2 Ration.	lbs.					
Green Crop	35	27·76	·45	4·13	·14	4·72
Silage	30	23·73	·24	3·48	·21	3·93
Lucerne Hay	5	·42	·52	2·07	·05	2·64
Oaten Hay	10	·89	·43	4·61	·15	5·22
Bran	5	·60	·63	2·20	·15	2·98
Oil Cake	1	·09	·22	·42	·12	·76
Oats (Crushed) ...	1	·11	·09	·45	·04	·58
Malt Combings	1	·09	·20	·36	·02	·58
	88	53·69	2·78	17·75	·88	21·41
	Nutritive ratio, 1 to 7·1.					
No. 3 Ration.	lbs.					
Green Crop	30	23·79	·39	3·54	·12	4·05
Silage	25	19·77	·20	2·90	·17	3·27
Oaten Hay	15	1·33	·64	6·96	·23	7·83
Crushed Oats	1	·11	·09	·45	·04	·58
Oil Cake	1	·09	·22	·42	·12	·76
	72	45·09	1·54	14·27	·68	16·49
	Nutritive ratio, 1 to 10·2.					

* * * * * * * * * *

COST OF FEEDING INFANTS.

TABLE showing the average Relative Cost of feeding a thriving Infant, up to the age of 9 months, with Milk and with Patent Food, reckoning on the basis of 4d. per pint for Milk and 18s. per dozen 6-oz. tins for Patent Food.

Daily quantity of food required for an infant during first 9 months of life.	Milk.	Patent Food.	Cost of Milk	Cost of Patent Food.	Saving effected by Milk Diet.
	oz.	oz.			per day.
1st week	12	1	2¼d.	3d.	½d.
2nd to 3rd week	18	1½	4d.	4½d.	½d.
3rd to 6th week	20	2½	4d.	7½d.	3d.
6th week to 3rd month ...	30	3½	6d.	10½d.	4½d.
3rd to 5th month	35	4½	7d.	1s. 1½d.	6½d.
5th to 9th month	40	5	8d.	1s. 3d.	7d.

THE MARKETING OF EGGS.

H. V. Hawkins, Poultry Expert.

That there are numerous outlets for eggs cannot be denied, but there are ways and means of securing a much more uniform price than is usually obtained. A great number of farmers pay little or no attention to the regular gathering of eggs, and through carelessness lose heavily each year. Stale and fresh eggs are indiscriminately put into old cases with simply chaff packing, and that often musty, the result being that the buyer often makes an absolute loss on his purchase.

The principal buyers are the export agents, produce dealers, biscuit manufacturers, confectioners, caterers, hotel and restaurant keepers, hospitals, asylums, and the general public.

QUALITY.—*The general rule is to consider newness the only desirable* quality in eggs. More than this is necessary, the daily gathering of the eggs being essential; in fact, when the temperature exceeds 80 degrees, this should be done twice a day. Through being permitted to remain in the nests three and four days, during which period they may be sat upon by a dozen hens, the eggs become spoilt and in many cases incubated. The change which takes place during 72 hours' exposure to the sun's rays, or during the many visits to a cosy nest by more than one hen disturbs and disflavours the egg. The two changes which cause the greatest objection are due to the development of the embyro chick or to the formation in the decaying eggs of the very foul-smelling hydrogen sulphide gas.

If eggs are exposed to the rays of the sun, or to dampness for any length of time, much of their goodness is destroyed.

For food purposes fresh eggs are equal in value, although varying in tint of yolk. Some are pale, whilst others are much darker. This paleness is undoubtedly due to a lack of green food, whilst an excess of grass and animal food will very materially darken the yolk. It is admitted by many authorities that the white of the spring egg is of firm quality and will "stand up" better than that of the summer egg. With this I fully agree.

Newly-laid fertile eggs cannot be distinguished from infertile eggs, the germ of the chick being microscopic in size. If the egg is immediately cooled and kept at a temperature below 70 degrees F., the germ will not develop. At a temperature of 103 degrees F. the development of the chick proceeds rapidly. It will readily be understood that a fairly low temperature is best for eggs intended for market purposes.

GRADING.—No farm products are more difficult to grade than eggs, as they require separate and careful handling. Grading, as we know it, is usually confined to size, colour, and approximate freshness, but to the expert candler it means much more.

As the heavy laying period approaches, the egg grader is usually hard at the work of candling; a stronger light is requisite where many tons of eggs have to be tested. The light is enclosed in a box or a tin cylinder in which are made openings the size of a two-shilling piece. The room being darkened, the candler holds the egg to the light, large end upward, and gives it a quick turn in order to view all sides and to cause the contents to whirl within the shell. A very stale egg will whirl about as if filled with water; in other cases there appears a marked increase of space in the air sac (broad end), clearly showing the amount of evaporation that has taken place, or loss of weight. To prevent this loss in

weight, eggs should never be kept in a hot or warm room or exposed to draught for any length of time; but should be kept in dry drawers or sectional cupboards in a fairly even temperatured dairy or storehouse. For culinary purposes, infertile eggs are best, as their keeping qualities are greatly enhanced.

CAUSE OF OBJECTIONABLE FLAVOURS.—The flavour or odour of an egg may be noticeably influenced by the feed given. This has been demonstrated by feeding hens heavily on maize, musty or smutty wheat, tainted meat, turnips, spices, or an excess of onions. The principles underlying feeding should be the providing of a mixed diet and the avoidance of an excess of any one particular food. At times many peculiarities are found in eggs, such as blood spots, a broken yolk, or some bacterial contamination. These are due largely to improper feeding, putrid meat, in the writer's opinion, being chiefly responsible.

SHELL VARIATION.—Egg shells vary in colour, firmness, and shape. These variations are more a matter of breed or the individuality of the hen than of feed, except in cases where shell-forming material is not provided. Strength of the shell is very important, owing to the great loss which occurs, not only in marketing, but when used for hatching purposes. Too much "forcing," viz., an excess of meat and a lack of mineral matter will tend to develop weak shell formation.

MISSHAPEN EGGS.—Hens that constantly lay malformed eggs should be got rid of, as their progeny are liable to the same trouble. The causes of these badly-shaped eggs are many. Whilst dissecting birds, I have noticed that many hens have had slight ruptures in the oviduct, or a slightly misplaced egg channel, causing a difficulty in laying. A slight stoppage of the egg when about to be laid creates a dent in the centre of egg. Such eggs are best eaten straight away, and should on no account be used for incubation purposes.

BROWN V. WHITE SHELLED EGGS.—For some time past the English buyers have laid stress on shell colour, preferring the brown shell to the white. An idea has got abroad that the brown egg is of greater value for culinary purposes than the white. This is quite an erroneous idea. The Leghorn, Minorca, or Andalusian egg is quite equal in its nutritive value to that laid by such breeds as Orpingtons, Wyandottes, and Plymouth Rocks, etc. In my opinion, colour counts for little. Those accustomed to the use of brown-shelled eggs naturally prefer them, but the same applies to white eggs. Uniformity of colour, as well as other points, pleases the eye, and for that reason, and no other, should there be any preference.

SIZE.—The size of egg is chiefly controlled by the breed or by the selection of layers of large eggs, particularly the latter. Pullets at the beginning of the laying period lay eggs decidedly smaller than those produced at a later stage. The average food value is a little greater in large eggs per pound than that of small eggs, because of a smaller percentage of shell in the former.

That the breed influences the size of egg is undisputed, and it may be as well to remind readers of the breeds which are in the front rank as producers of large eggs. They are Minorcas, Spanish, Andalusians, Black Orpingtons, Leghorns, and Plymouth Rocks, whilst on the other hand, Wyandottes, Hamburghs, and most of the game birds lay a relatively small egg. Some of the finest eggs I have ever seen were produced by an Orpington-Minorca cross. Good specimens of eggs are the rule with Plymouth Rocks, and Black Orpingtons, those of the latter being of a beautiful brown tint.

DIRTY EGGS.—Dirty eggs are grouped roughly in three classes:—

(*a*) "Plain dirties," those to which soil or dung adheres;
(*b*) "Stained" eggs, those soiled by contact with damp straw or other material which discolours the shell ("plain dirties" when washed usually show this appearance);
(*c*) "Smeared" eggs, those covered with the contents of broken eggs.

The farmer is to blame for the first two classes. The third class is found all along the route from the nest to the consumer. The percentage of dirty eggs varies with the season and weather conditions. It is noticeably increased during wet weather, especially when nests are exposed. Covered nest boxes prevent discolouration, and, in many cases lessen the chance of the hens eating their eggs. Hundreds of pounds are lost annually by farmers through permitting their hens to lay in open-top boxes. The birds jump down into nests where other birds have laid and this often results in broken eggs.

CO-OPERATIVE ACTION NECESSARY.—If the present rate of progress continues, and I firmly believe it will, farmers will find it necessary to adopt similar methods of marketing eggs to those in operation in Denmark, viz., by means of co-operative egg export societies.

About one-half of the local egg trade is handled by private dealers, who are equally severe in rejecting bad eggs and maintaining the quality. One of the easiest methods of marketing eggs lies at the very door of our co-operative butter factories. Surely, if a farmer has one or two cans of cream to deliver to the factory, what is to prevent him taking, say, 60 doz. eggs at the same time. The buying of eggs at the creameries has been much talked of, but little action has so far been taken.

BUYING EGGS BY WEIGHT.—It is recognised by leading egg farmers that the time is ripe for the disposal of eggs by their weight. Action should be taken in this connexion, ere the breeds are allowed to deteriorate—as they surely will if no inducement is held out to the farmer, who is careful to market only eggs of fair size.

ESSENTIALS NECESSARY IN PRODUCING GOOD EGGS.

Hens that produce 180 to 200 eggs yearly.

Hens that produce eggs of 2 oz. weight on the average. The breeds already mentioned may be expected to do this.

Good housing, regular feeding and watering, and clean dry nests.

Gathering eggs daily. When the temperature is above 80 degrees gather twice daily.

Confining broody hens as soon as discovered.

The rejection, as doubtful, of all eggs found in a nest not visited the previous day. Such should be used in the home.

The placing of summer eggs, as soon as collected, in the coolest place.

The prevention, at all times, of moisture in any form, coming in contact with the egg.

The disposal of the cockerels before they get among the hens. Also, the selling of old male birds, or confining same from the time hatching is over until required again.

The using of cracked and dirty eggs in the home.

The marketing of all eggs at least once each week, oftener if possible.

Keeping eggs as dry and cool as possible when *en route* to market, or when stored.

Keeping eggs away from bad odours, or musty cellars.

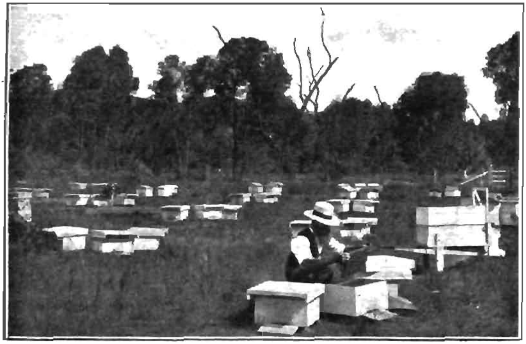
The use of strong, clean cases and good fillers.

SPRING MANAGEMENT OF BEES.

R. Beuhne, President, Victorian Apiarists' Association.

Bees are best left entirely undisturbed during June, July, and August. If all colonies are examined in April or May to see whether they have sufficient stores (25 to 30 lbs. of honey) and a laying queen, there is no need for the bee-keeper to open the hives during winter. Moreover, if anything should be wrong, no steps can be taken to rectify it during the winter months.

During the first or second week in September, however, all colonies should be examined to see that there is a queen in each hive and stores enough to meet the increasing demands of brood-rearing. At this time of the year, it is better to err in having slightly too much honey in the hives rather than too little; for when, later on, brood-rearing is in full swing



SPRING EXAMINATION OF HIVES.

stores will rapidly disappear should unfavorable weather prevent bees flying out to gather new stores. A colony which comes to the verge of starvation in spring destroys, first, the unsealed larvæ, and, eventually, even tears out the sealed brood, thus doing away with the coming generations of workers.

To provide against such emergencies, not only should each colony have plenty of stores at the beginning of winter, but the bee-keeper should set aside a number of combs of sealed honey during the previous summer. Should a shortage occur in any of the colonies, he can at once supply the want by removing an empty outside comb from the brood chamber and replacing it with one of sealed honey. In order to keep combs of honey from one season to another it is necessary that they should be taken indoors and kept closed up and moth-proof in a dry place.

The object of the first spring overhaul of bees is to find out the condition of colonies with a view of working them up to a maximum strength in bees for the honey flow, with a minimum of labour and attention.

This will enable the bee-keeper to look after a greater number of colonies and to avoid all unnecessary operations; at the same time he will have perfect control of his apiary.

My own practice is as follows:—All my queens are clipped—one wing only. This enables me to know their ages, which is necessary for the carrying out of my system. There are many bee-keepers who, for various reasons, object to clipping queens. They can, however, have the advantage of knowing the ages just the same, if they mark their queens by clipping off the extreme tip of one upper wing, thus distinguishing the queen without preventing flight. My hives, and also the queens, are numbered. I keep a register which shows which queen is in each hive. Before commencing with the spring overhaul, I rule a page in my pocket book into eight columns Over the first four, I put the figures 1, 2, 3, 4; over the fifth, L (for light); the sixth, H (for heavy); the seventh, I. Qu. (Inferior Queen); and over the eighth, Notes.

Starting at the nearest corner of the apiary I open hive No. 80. I find there are three combs of brood and enough stores. I notice the queen is clipped. I close the hive and write 80 into column three. No. 79 has 4 combs brood but rather too little honey. Queen is clipped. I therefore put 79 into column "4" and also into column "L." In this way, I go right through the whole apiary. Any colony very heavy in stores is entered under "H," and colonies with but one frame of brood under 1. If I find an unclipped queen, it shows that the former queen has disappeared and that a young queen has been raised since the autumn overhaul. Being raised out of season, she is worthless, and so the number of this hive is put in the seventh column and the queen is replaced by a better one as soon as convenient. Any colony showing disease, queenlessness, or anything abnormal is noted in column 8.

The actual time occupied at each hive is not more than one to three minutes. Having completed the examination, my book contains a list which shows at a glance the state of the whole apiary. Any colonies very short of stores are supplied from the honey house with a comb of sealed honey, so that even those appearing in the "light" column require no attention for at least a fortnight. Should bad weather prevail it is only necessary to look at those colonies which were light and supply them if required.

It is yet too early to assist any of the smaller stocks—those with one or two combs of broods—with brood from the stronger ones. To shift brood from one hive to another in early spring is merely wasting it. Every colony with a normal queen has all the brood which the number of workers it contains can attend to. Even if the temperature permits, taking a comb of brood from a strong to a weak colony is robbing the one without benefiting the other. Later on, in October, this may be done with advantage; but, even then, the medium colonies and not the weak ones should be strengthened first with brood from the strong ones. Weak colonies are best helped later on when the weather is fairly warm. In strengthening them with brood from other stock, the brood nest should be kept as compact as possible, and instead of adding combs of brood it is at first better to exchange a comb of unsealed brood for a comb with a larger amount of sealed brood from a strong colony.

The colonies likely to have brood to spare and those which need it are easily ascertained on reference to the note-book. A queenless colony, if still fairly strong, may be kept going, and even built up, till a queen is available by giving it a comb of eggs once or twice a week. This comb of eggs is obtained by inserting a partly empty comb between the brood combs

of a strong colony till well laid into by the queen. As queens are capable of laying more eggs than the worker bees can attend to at this time of the year, this will not interfere with the progress of that colony.

With October, the swarming season approaches. If the ages of the queens are known, swarming is much more easily controlled, if not altogether prevented. Colonies with queens of the previous season's raising rarely swarm, if properly managed. Of colonies with two-year-old queens, a moderate number swarm. Colonies with three-year-old queens are most inclined to swarm. By having a table giving the numbers of hives with three-year-old, two-year-old, and one-year-old queens in separate columns the work of supervision is greatly reduced. Thus, if we wish to prevent swarming by destroying queen-cells, or to anticipate it by artificial swarming we need not examine all the colonies every ten days, but only the three-year-olds, and the two-year-olds once every sixteen or eighteen days.

As in modern bee-keeping, every queen, regardless of age, is replaced as soon as she proves unsatisfactory, it follows that only a limited number of queens get to be three years old. In an apiary of 150 colonies, the approximate number of queens is as follows:—One year, 70; two years, 50; three years, 30. In ordinary good honey country, the 70 one-year-old queens can practically be left out of account in the matter of swarming. Reference to the notes of the spring overhaul will show a number of colonies with two-year-old queens amongst the stocks which have only one or two combs of brood and, even though these may have been built up with brood from others, the ratio of young bees to old is such that no swarming is likely to occur till later in the season. The same may be said of some of the stocks with three-year-old queens, so that instead of watching for swarms from 150 hives or examining that number every nine or ten days, there will be about 20 to look through every ten days and another 20 every 18 days. When preparations for swarming are noticed, it may be done artificially by the apiarist in a way which will be described in a subsequent issue.

PRICKLY PEAR: A PEST OR A FODDER PLANT?

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

As a variety of statements are current in regard to the value of prickly pear, some of which are highly misleading, it may, perhaps, be as well to give a short condensed account of the facts definitely known in regard to this plant, and to its nearest allies.

Firstly, to dispose of one popular myth, namely, that Luther Burbank was the first to develop a spineless form of cactus. The term "prickly pear" includes various species of *Opuntia*, some of which have been spineless or nearly so for ages, while even the most thorny forms occasionally develop nearly spineless shoots, which when separately propagated may retain the same peculiarity. In a condition of nature however, these thornless sports either revert to the thorny condition or tend to be eaten out by stock, the thorniest individuals surviving. Under suitable conditions, however, or when protected in some other way, thornless forms may survive, and a few species in certain *genera* of Cacti, never appear to have developed thorns. Both at the Sydney and Melbourne

Botanical Gardens, thornless varieties of the common *Opuntia* have long been known, so that at the present day, it is impossible for any single person to claim the sole credit of developing a spineless Cactus (*Opuntia*).

A much more important misstatement is prevalent as to the value of the Cactus as fodder, some having even gone so far as to advise farmers to cultivate this noxious pest, to provide fodder for stock. Spiny Cacti can only be used as fodder after special treatment to destroy the spines and spinules or to render them soft and harmless. It has been stated that farmers, in the dry southern districts of the United States, burn off the spines with the aid of a torch and so render the plant available as fodder for stock. This may be of some use in times of drought, where farmers have not provided themselves with stored fodder, but except where abundant supplies of cheap labour are available, it would be a very expensive way of permanently feeding stock. Cacti are exceedingly watery, very poor in nitrogenous (proteid) food, and by themselves would need to be eaten in almost impossible quantities to maintain stock in good condition. The best comment upon the supposed high value placed on prickly cactus in the United States, is afforded by the following extract from the Farmers' Bulletin, No. 72, of the U.S.A Department of Agriculture :—

"Hundreds of square miles of the richest grazing country in Southern Texas, U.S.A., have been overrun with prickly pear, and the growth is each year becoming more impenetrable. In many of the southern countries, it has been estimated that this cactus has already decreased the carrying capacity of the ranches one-fourth to one-third. The prickly pear is indeed a curse to the stock country. Some years ago, before cotton-seed hulls and meal were available as a fattening food, the pear was quite largely used after the spines had been disposed of, by roasting or boiling. Now, the cheaper and better cotton-seed hulls, which do not require a like amount of labour in their preparation, have almost entirely displaced it as a forage. The fruits are produced in great abundance, and when ripe are eaten with evident relish by birds, hogs, and cattle, and the seeds are thereby being very rapidly disseminated over whatever country is still free from it. Not only does the pear increase from the seed, but if a joint of the stem is broken off and falls on the ground, it takes root and produces a new plant.

As a result of this rapid increase of prickly pear, the grass is being eaten to the roots wherever stock can get at it between the clumps of cactus. Paths are worn and the ground is trampled and packed, and the only grasses that are allowed to ripen seed, are those growing within these thorny citadels of cactus plants. Cattle on the range will not eat prickly pear unless driven to it by hunger or thirst. It is a better substitute for water than for food, but with this statement of fact the best has been said concerning the forage possibilities of this plant. It is a fact that it is spreading every year over a wider extent of range country, and that its presence in any considerable quantity is, on the whole, detrimental to the best interests of stockmen."

In New South Wales, the plant has sometimes been used as a supplementary fodder after prolonged boiling or treating with superheated steam, so as to soften the spines. Here, again, it must be remembered that the bulk of the plant in regard to its food value is considerable, and that the cost of treatment is proportionately great. Where no other green feed is available it may pay to use a portion of the growth covering the land, in this way, but it will not pay to cultivate it for this purpose.

In South Africa, the select committee appointed by the Legislative Council of Cape Colony, reported in 1890, that the prickly pear had spread to an alarming extent, especially on good land, depreciating the value of the land in certain districts by as much as 50 per cent.

As the result of many tests, spraying with arsenite of soda (1lb. to 5 gallons of water) to destroy the plant has been recommended, but to make the spraying fully effective, the plants should be previously punctured on all sides with a fork, so that the poison obtains free entry.

During my recent visit to Sydney, Mr. Maiden arranged for a demonstration of a new method of destroying prickly pear which its inventor was supposed to have used successfully in Queensland, but which was merely based on the above principle of puncturing the stem to admit poison. Even assuming that the treatment as shown was fully effective, its cost worked out to over £4,000 per square mile, or £7 an acre, which is more than most of the land affected by prickly pear is worth, when cleared. The use of a heavy roller has been recommended, but grubbing out, piling, spraying the heaps, and burning when dry is the only method of permanently clearing. Even then the land is readily re-infected by seed carried by birds, etc.

The spiny cactus was originally introduced by Governor Phillip in 1789, apparently for the purpose of starting the cochineal industry in New South Wales, but had not long been cultivated, before it ran wild, and became the terrible pest it now is in Queensland and in New South Wales north of the Hawkesbury River.

The fruits of the prickly pear are used as food for man in Sicily, North Africa, and some parts of the United States, the prickles being removed by rubbing with a cloth. They contain up to 14 per cent. of sugar, but barely more than ½ per cent. of nitrogenous food, so that they are comparable as regards food value, with sugary fruits like apples or pears, have a less food value than a potato, but rather more than a carrot or fodder beet. According to Wolff, 3 pounds of prickly pear fruits are equal to 1 pound of good dry hay. This applies only to the fruits of the prickly pear; those of the spineless forms, which also grow in North Africa (Tunis, etc.) and probably contain less sugar, do not appear to be used by the natives as food. Further, the collection of the fruits is exceedingly unpleasant work, and the cost of collecting them in quantity as food for stock would be quite considerable. The same objection would apply to their suggested use for distillation purposes, while the vegetative parts are too bulky in regard to the small amount of fermentable carbo-hydrate they contain, to make it profitable to use them for this or any similar purpose.

SPINELESS CACTI.

According to reliable information, some of the spineless cacti sold by Burbank have been privately imported into Victoria with the intention of encouraging farmers to plant them as fodder for cattle. It is not likely that any forms of cactus will thrive to such an extent as to become pests in the colder and wetter regions of Victoria, but this might be the case in the drier and warmer North-Western districts. It must be remembered that there is always a possibility of the spineless forms reverting, when wild, to the spiny condition. Apart from this, the fodder value, even of the spineless forms of cactus, is not very great. They are more stores of water than of food. In addition, they contain a certain amount of tough fibre, which has been known to cause impaction in stock grazing upon them, and which is only softened by prolonged boiling. The usual effect of such watery food is, however, to cause scouring, and this, coupled with the tendency of the plants to become acid during the night-time, prevents stock from fattening when fed exclusively upon them. Pigs will chew spineless cacti and reject the fibre, and stock in general take it rather as a source of water than of food, although cows will swallow it like other food. As far as the evidence goes, therefore, it is not possible at present to recommend the cultivation of the spineless forms of cacti, and in fact, the farmer who encourages the development on his

land of any form of cactus at present definitely known to science will be ill advised.

The common prickly cactus is proclaimed for the whole State. If Burbank's spineless cacti are varieties of this species (*Opuntia monacantha*) they are also proclaimed, and it would be illegal to spread or propagate them in Victoria. There does not, at present, appear to be any reason for relaxing the proclamation in regard to the spineless varieties and, until more is known about them, it would not be safe to do so.

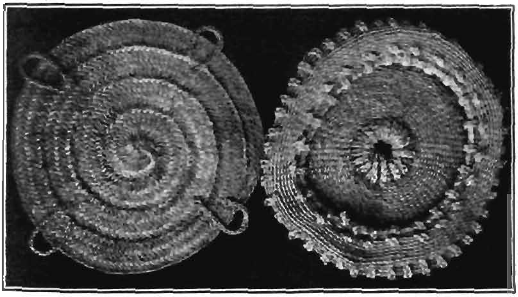
SHERRY: ITS MAKING AND REARING.

F. de Castella, Government Viticulturist.

(*Continued from page 528.*)

FERMENTATION.

Fermentation takes place in the butts, which are filled direct from the press and carted into the bodegas in the town of Jerez, as has been already stated; the *mosto*, as the juice is termed at this stage, is often in brisk fermentation on arrival at its destination. A photograph shows the mule carts in which the wine is brought into the town.* Each cart usually carries two butts; sometimes these carts are drawn by bullocks.



MATS FOR SUNRIPENING AND FOR PRESSING GRAPES.

Immediate removal to town is the general rule; though, in a few instances, fermentation is allowed to take place in the *casa de lagares*, where the grapes are crushed, these are seldom of sufficient size for storage to be convenient. Besides, once in town, the wine is under the immediate control of the skilled cellarman, and has therefore a better chance of receiving proper treatment. Another reason for prompt removal is the bad state of the Jerez roads, which are about the worst I met with in my travels through Spain. These remind one a good deal of our own Wimmera district. Road-making is difficult, as any metal used in filling ruts soon sinks out of sight. It is therefore desirable to have the carting

* At the time of my visit, the new wine had already been transferred, hence it was not possible to take photographs of loaded carts.

completed whilst the roads are still in tolerable order, and before the winter rains have made them almost impassable. In former days, it was at this stage that the almacenista appeared on the scene, and it was to his bodegas that the *mostos* were carted. The reconstituted vineyards now mostly belong to the large merchants, who bring their new wines into their own establishments.

Fermentation takes place in the well ventilated bodegas of the usual type peculiar to Jerez, or, sometimes, even in the open air, as illustrated in the photograph showing portion of the grounds of Messrs. Gonzalez, Byass and Company, where the *mostos* undergo fermentation and remain undisturbed until the first racking, with no other protection than the shelter of a few acacias. Under such conditions the advent of the cold weather is better able to exert its beneficial effect and to hasten the clearing of the wine, thus preparing it for early racking.†

JEREZ WINE CARTS.

The *mostos* ferment quietly and steadily, and without throwing much froth out at the bunghole. Nothing seems to be done to control the process or to limit temperatures in any way. Fermentation is entirely spontaneous. The use of plaster, when crushing, has no doubt much to do with regularizing the process, as has also the comparatively small bulk in which it takes place—less than 100 galls., for the butts are never full. Thus it is that ill effects seldom seem to result from the churning up and heating the young wine receives in transit during weather which is often hot, conditions which are scarcely favourable for satisfactory fermentation. Nevertheless, "off" casks are not unknown. Among the many young wines I saw were occasional "scuddy" ones. "Scud" is the term used by the English merchants of Jerez to designate the disease of wine, due to the development of filiform bacteria known in French as *tourne*, and characterized by the spiral, silky cloud which is not unknown to us in Northern Victoria, where it is often erroneously termed "ropiness."‡

† This is quite in accordance with the ideas of Dr. R. Carles on the use of cold in wine-making, *see Journal* Vol. VI., p. 398.

‡ *Ropiness is really due to an entirely different ferment.* It is little known either in Australia or Southern Spain, being limited to wines of low alcoholic strength, and deficient in tannin. A ropy wine though clear, is viscous, pouring out like oil.

At the completion of fermentation, an examination of the young wines reveals a curious state of affairs which constitutes one of the interesting features of the making of Sherry. The contents of the different butts differ from one another in a very marked manner, scarcely any two of the young wines being exactly alike. Made as has been described above, with each butt the result of a separate pressing, uniformity is not to be expected, and slight differences of composition, of gravity, of temperature, &c., would influence the resulting wine, but the differences are very much greater than the above reasons would lead one to expect. Different butts made from the same block in a vineyard, planted with the same variety of vines, may turn out, even immediately after fermentation, to be absolutely different wines; one may be pale in colour and delicate, whilst the very next butt may be golden yellow and of quite distinct character. As was suggested to me (see page 520), the yeast

YOUNG SHERRIES FERMENTING IN THE OPEN AIR.

responsible for the fermentation has most probably a great deal to do with these differences. The point is an interesting one which awaits further study.

This variability necessitates a sorting out or classification of the various types, much in the same way as one drafts sheep; this operation is really the starting point of the several distinct styles or types of Sherry referred to on page 516, and as such one of the salient features in the making of Sherry.

The period at which it takes place is variable. In some bodegas, the older system of leaving the young wines untouched till midwinter, or even later, is followed, the classification taking place after the new year, or even at the second racking, in spring. In others, a preliminary classification takes place before Christmas. Since fashion has decided in favour of wines of the fino type, lighter than those made formerly, this early examination has become more usual. Such wines, fermenting more rapidly, require earlier attention than the heavier wines of fifty years ago. Once fermentation is terminated, the protecting layer of carbonic acid in the upper portion of the cask soon disappears, exposing its contents to damage from ullage.

San Andrés Mosto Vino es, says an old Spanish proverb; in other words, by St. Andrew's Day (30th November) the must is wine. Acting on this, in some bodegas a preliminary sorting is made about the end of November, which saves many butts of lighter wines from becoming pricked. Sometimes, even thus early, such wines are covered with a film of *flor*, and unless their alcoholic strength be raised to a safe point acetification is liable to occur.

Differences between individual butts are not limited to the character of the wine, but concern also the rapidity and completeness of fermentation. Some ferment out rapidly, and are almost limpid in a few weeks' time; others ferment slowly, and even at midwinter still show traces of fermentative action. A few cease working whilst yet slightly sweet, the untransformed sugar giving rise to a fresh fermentation in the spring. In a general way, scarcely two casks behave exactly alike, and great differences are to be noticed in the resulting wines in consequence.

RACKINGS.

Sherry is a wine which is scarcely ever racked. It, in fact, receives in the whole of its life rarely more than two rackings, such as we understand this process, for the method to be described presently by which it is passed onward through a series of stages, which make up the *solera* system of rearing, can scarcely be termed racking.

In former days, the usual rule was for the first racking to take place about midwinter, and the second in spring. At each of these rackings it was customary to increase the alcoholic strength of the wine by a slight addition of alcohol*—enough to increase the strength by two or three per cent. proof, not more. Sherry is not heavily fortified from its early youth, as Port is. In the case of a preliminary November classification being made, such wines as are sufficiently advanced to be immediately dealt with are then racked, the others remaining over until midwinter, when they are again examined, or even later.

THE CLASSIFICATION.

Whether classification takes place by St. Andrew's Day or later, the basis on which it is carried out is the same; the wines are drafted into one or other several well defined types. The contents of the cask are tasted, and the chalk mark, characteristic of the type to which it is assigned, is marked on it for further reference.

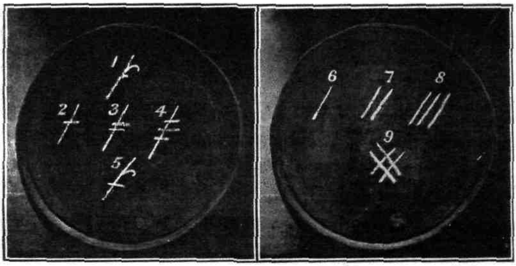
The following are the types into which the different wines are drafted:—

Palma.	
Palo Cortado	These constitute a group of similar wines.
Dos Cortado	
Tres Cortado	
Un Raya	The Rayas likewise constitute a group.
Dos Rayas	
Tres Rayas	
Parilla ...	Wine for distillation.

The chalk marks by which each type is distinguished are shown in the photographs. The importance of this classification and its bearing on the further evolution of the wine justifies a detailed description of the character of each of the above types.

* In one of the bodegas I visited, it was explained to me that it was necessary to add a little spirit when racking to make up for the fact that "It no longer had its lees to feed on."

Palma.—This is the type which forms the basis of the *fino* class of Sherries, with its subsequent development of amontillado, &c. Its chief characteristics are delicacy or refinement, a very pale colour, and a low alcoholic strength. The young wines classed as palmas come as a complete surprise to any one unacquainted with the evolution of Sherry, for they are about as different from the finished wine as it would be possible to imagine. One is inclined to ask if they are not more likely to develop into a light wine of Chablis type than into Sherry. A palma rapidly concludes its fermentation, and before Christmas the wines of this type are usually quite dry and remarkably clear; they are the first wines ready to be dealt with, and can be separated from the others and racked off their lees, &c., immediately. The chalk mark used to distinguish the type (*No. 1 in photograph*) is supposed to resemble a palm leaf. Their alcoholic strength being low (usually between 23 per cent. and 25½ per cent. proof), it is necessary to increase it somewhat (at least that of the lighter palmas) by fortification. When racked it is usual to bring the strength of all



SIGNS USED TO DISTINGUISH DIFFERENT TYPES OF YOUNG WINE.
(1) Palma, (2) Palo Cortado, (3) Dos Cortado, (4) Tres Cortado, (5) Palma Cortado, (6) Un Raya, (7) Dos Rayas, (8) Tres Rayas, (9) Parilla.

palmas to the uniform standard of 25½ per cent. proof, a strength sufficiently high to protect the wine from acetification, yet not high enough to interfere with the healthy growth of the *flor* film. The spirit used for fortification in Jerez is highly rectified wine spirit, usually about 65 per cent. o.p. It is thus entirely different from the spirit used for the fortification of Port, which, though of high quality, is purposely distilled at lower strength, so as to retain as much as possible of its winy flavour. So far advanced are palmas, even at this early stage, that they sometimes immediately find their way into a solera. It is usual, however, for them to be kept separate until after the second racking. According to the local term, they remain as *añadas* until after the second racking. This term needs defining, for it is one much used in connexion with Sherries. *An añada is a wine belonging to one particular vintage, as distinguished from a blend of several vintages, such as a wine forming part of a solera must necessarily be.* Until such time as it is blended into a solera, the contents of a butt are known as an añada. In one bodega I visited the term *Sobre Tabla* was applied to wines in this stage.

The Cortados.—These are in strong contrast to the previous type. *Palo Cortado* means literally cut pole, *i.e.*, a pole or stick with a notch cut on it, and this, the chalk mark, used to distinguish this type, is supposed to resemble (2 in photograph). Such a wine is the basis of Oloroso Sherries, just as a palma is that of *fino* wines. A young wine marked as Palo Cortado is a good deal more alcoholic than a Palma—usually over 27 per cent. of proof spirit, and often distinctly golden in colour. Though remarkable for its cleanness and absolute freedom from any trace of coarseness, it has far more character and body than a palma. A novice has not the same difficulty in realizing that such a wine will eventually develop into a Sherry.

Dos Cortado and *Tres Cortado* (meaning, respectively, twice cut and thrice cut) differ but in degree from Palo Cortado. They are bigger and fuller wines, and are not met with so frequently as the other types. A *Tres Cortado* is, for example, quite exceptional—an extra fine wine of which great things are expected. Such a cask may remain for years as an añada, thus constituting the exceptional case of a "vintage Sherry." The cortados generally take longer to ferment than palmas. Though they may be fit to rack at the preliminary classification, they are more usually left over until midwinter before being separated from their lees. It is this group which appears to depend largely for its peculiar character on the development of the apiculatus yeast during the early stages of its fermentation.

Though the cortados are very distinct from palmas, an intermediate wine is occasionally to be met with. Such a wine is marked as a *Palma cortado* (No. 5 on photograph). These wines are rare, and therefore merit only passing mention. They serve to give an idea of the complexity of the question, individual firms occasionally singling out different intermediate types in this way.

The *Rayas* constitute a rather lower grade group. Raya simply means a chalk mark—the number of marks given is in inverse ratio to the quality of the wine. We thus have casks marked as *un raya*, *dos rayas*, and *tres rayas* (1, 2 or 3 marks) in descending order of merit.

A wine marked as *un raya* (No. 6) is a sound, well fermented, wine free from any trace of coarseness, but not quite delicate or light enough for a palma, and not possessing sufficient distinction or body for a palo cortado. It is, in fact, a wine without marked qualities or faults. It may develop into something better, but for the time being it is premature to decide what is to be done with it. Such a wine is usually kept as an añada for at least a year. It may, according to its strength and body, eventually find its way either into a fino or an oloroso solera.

Dos Rayas is marked on a wine which has a tendency to be coarse or basto—but only slightly so. If at the end of a year or so this defect has decreased, it may still prove a useful wine. It is usually fuller than the prevous type, and therefore finds its way into oloroso rather than into fino soleras.

A *Tres Rayas* wine possesses the same defects as the previous one, but in a higher degree. Excessive pressing of the grapes is often responsible for a cask being drafted into this class, which is seldom used, except for blending into cheap sherries, if, indeed, it does not find its way to the still.

The rayas, as a class, are rather a temporary group—a waiting room, if the term may be permitted, rather than a very distinct class. The wines which turn out best among them find their way into oloroso rather than into fino soleras.

Parilla.—The last group we have to consider is that of the faulty wines only fit for distillation. Parilla, in Spanish, means a gridiron, as typifying the grating in the firebox of the still, and it is this that the obliquely crossed double lines, with which the casks are marked, are supposed to represent (No. 9). Formerly three lines were usually drawn each way. The three main faults which lead to the condemnation of a young wine are—

> Acetification (becoming pricked),
> Scud (bacterial fermentation),
> Coarseness or basto.

It was my privilege to go through a collection of young wines shortly after the preliminary (November) classification with Don Pedro Gonzalez, of whose kindness and valuable assistance to me whilst in Jerez I cannot speak too warmly. I was thus able to taste young wines of all the different types. Of the many interesting points which were then brought under my notice, the two which, perhaps, impressed me most forcibly were the lightness of the palma type and the nature of many of the parillas. I was surprised to see some quite sound, though somewhat coarse, wines sent to the still—wines which many a capable Australian cellarman might describe as the "makings of a very good Sherry." I was equally surprised to see wines which appeared to me to be almost pricked marked as rayas, and in one case even as a palma—a coarse taste is more dreaded by the skilled sherry rearer than a slight acetic taint.* It was explained to me that such a wine, provided the acetic taint was not too pronounced, would, after its alcoholic strength had been brought up a couple of degrees, develop under proper treatment into a high grade wine, whereas nothing could be expected of a wine with a basto taint—it would never make a Sherry.

At this first classification it is not possible to assign to every butt its definite mark. Such wines as have completed their fermentation and are sufficiently advanced are alone dealt with, the others being held over for further examination later, especially such wines as are not yet dry. The parillas are eliminated and sent to the still. The palmas and the more forward of the cortados can already be classed and even racked, but a great many butts, not sufficiently advanced, must be marked, at least temporarily, as rayas, though some of these find their way into a better position later on. Such butts as are ready to be dealt with are now brought indoors, if they had been stored in the open; the others are left untouched.

The proportion of each type naturally varies considerably, but the increasing demand for *fino* wines has had for result that everything possible is being done to insure as many butts as possible developing on palma lines.

(To be continued).

* This seeming contradiction is explained by the action of the *flor* film which can live at the expense of acetic acid as well as alcohol. It is thus capable of *reducing* the acidity of a pricked wine, *see* Pasteur—"*Études sur le Vinaigre*," page 103.

TREATMENT OF ORCHARD PESTS.

P. J. Carmody, Chief Inspector of Orchards.

For all practical purposes, the insect pests of our orchards may be divided into two classes, viz., chewing insects and suctorial insects. On this classification will depend their treatment. Wherever possible, the former class should be controlled by internal poisoning, and the latter by insecticides that destroy by coming into direct contact with the insects themselves. Among the chewing insects the codlin moth reigns supreme, and can be most effectively kept in subjection by means of arsenical sprays. As the operation of spraying with these is fraught with considerable risk to foliage, growers should be guided in their use by the following hints:—

(*a*) No preparation should be used as a general spray without first testing it on a tree (or portion of a tree) of the different varieties to be treated, unless the grower has had previous experience with that particular brand.

(*b*) Some varieties are more susceptible to arsenical influence than others, the Bismarck being the most noticeable in this respect in my experience.

(*c*) Weak, stunted, water-logged trees are less resistant to this burning than young vigorous ones.

(*d*) In moist or foggy weather, this spray is far more injurious than when the weather is warm and equable.

(*e*) Water used in mixing the sprays should be free from any acids that will act as a solvent on the arsenic.

(*f*) Vessels, pumps, nozzles, hose, &c., should be thoroughly clean and free from Bordeaux mixture or any active agent that would cause mechanical or chemical changes to take place.

(*g*) The safest sprays are those having the least amount of soluble arsenic in their composition.

(*h*) The spray should be continuously and thoroughly agitated from the bottom of the pump up to the surface.

(*i*) Repeated sprayings with arsenic, when not wholly insoluble, often set up a kind of chronic derangement of the cellular tissues of the leaves not at first noticeable, but which causes the leaves to prematurely turn yellow and fall off.

(*j*) Extreme care should be exercised with the handling, storing, and application of these sprays. They should not be used at the ripening stage of fruit, nor for some time previous to its being pulled from the trees.

SPRAYING.

Codlin Moth.—In spraying for the codlin moth, it is necessary to apply the first application when the petals are falling and before the calyx of the fruit closes. The second spraying should be given when the eggs are on the fruit, so that the grower will require to be keenly observant for this period. The egg is readily discernible and is about the size of a pin's head, and of a yellowish white colour. Two or three more applications at not more than fortnightly intervals will suffice to keep the first brood in check. With late varieties, it is imperative to spray again towards the latter end of February. Of course, every grower recognises that no detailed system of spraying can be laid down, as the habits of the moth

vary in different districts, and even in the same district in different years; consequently, modifications of the above principle will be necessary as local exigencies demand.

To minimize the early attack of this pest the orchard should be thoroughly overhauled in the winter, and every shelter and hiding place for the insect examined and destroyed.

Pear and Cherry Slug.—As the slug completely destroys the leaves of the trees it attacks, they are prevented from carrying out their proper functions, and there is no elaboration of sap for the production of fruit buds. The energy of the tree is used up in producing a fresh crop of leaves, and the tree becomes debilitated and fruitless, if not absolutely destroyed. On the first appearance of the slug, the grower should spray with an arsenical preparation at a strength somewhat weaker than that used for the codlin month, but when the fruit is ripening he should spray with hellebore.

Root-borer.—From experiments carried on by Inspector Chalmers, of Maryborough, though incomplete, it was found possible to kill the perfect insect by spraying with the arsenates, as they live for a considerable period on the leaves of the trees they infest. In the future, it would be advisable for growers to give this mode of suppression a trial, and spray early—as soon as the leaves appear. All weeds and grass should be ploughed in before the insect deposits her eggs upon them. Traps should be placed on all trees affected, and the beetles regularly destroyed.

San Jose Scale.—This scale is very prolific and spreads rapidly, if no remedial measures are taken to keep it within bounds. So far as American experience goes, this scale, once established in an orchard, cannot be dislodged. If trees are large they should be judiciously reduced to a size convenient for spraying or fumigation. In dealing with the pest, fumigation is the most successful, and if any grower intends to adopt this method an officer of the Department will give him personal instruction. Satisfactory results have been obtained from spraying with red oil emulsion and the lime and sulphur wash in winter, and self-boiled lime and sulphur in summer.

Mussel Scale, Red Spider (Bryobia), Red Scale, Lecanium, Woolly Aphis.—Spray with red oil or crude petroleum oil emulsion, or lime and sulphur wash in winter.

Peach Aphis.—While dormant, spray with lime and sulphur wash; when leaves are on, spray with tobacco solution.

Apple and Pear Scab.—Spray with Bordeaux mixture before the petals of the bloom expand, and when the spray can run down along the stems of the flower. As some varieties of apples russet under the action of this spray, notably Jonathan, Sturmer, Ben Davis, Cole's Rymer, &c., it would be as well for growers to try the self-boiled lime and sulphur spray after the fruit has set, especially such fruit as is not unduly liable to black spot. This mixture must be properly made as directed, and only good lime used, with no cooking of the sulphur, otherwise serious damage to the foliage will ensue. It is wise to test a tree or two before generally adopting this spray.

Apricot Scab.—Spray with Bordeaux mixture before the petals expand, and continue the spraying after the fruit has set with the self-boiled lime and sulphur treatment for a couple of sprayings. (See Apple and Pear Scab above.)

Leaf Curl of Peach and Puccinia.—Spray before the appearance of leaves with Bordeaux mixture, and on varieties very subject to the disease

continue the self-boiled lime and sulphur treatment as a fungicide, which is likewise an insecticide.

Root Rot.—Remove soil from roots as far as possible, and apply Bordeaux mixture, a mixture of lime and sulphur, or sulphate of iron (1 lb. to 4 gallons of water), after having first cut away and removed the worthless roots. All roots of native timber should be absolutely removed from ground that is to be planted under orchard.

SPRAY MIXTURES.

Arsenite of Lead.—Boil 1 gallon of water with 1 lb. of arsenic and 2 lbs. of washing soda until arsenic is dissolved. Dissolve 7 lbs. of acetate of lead in 2 gallons of warm water. When not too hot add these two mixtures together and agitate thoroughly. Many growers boil them after mixing and claim good results. The above quantity is sufficient to make 360 to 400 gallons of spray.

Arsenate of Lead.—Dissolve 11 ozs. acetate of lead in half-a-gallon of water, in another vessel dissolve 4 ozs. arsenate of soda in half-a-gallon of water, pour the soda solution into the lead solution, stir, and add from 40 to 50 gallons of water. Hot water dissolves these chemicals more rapidly and completely than cold water. Wooden pails should be used. This product has a distinct advantage over all other arsenical perparations. It is practically harmless to foliage, remains longer in suspension, and is more adhesive. The process of manufacture is simple enough, but as there is often a difficulty in getting chemicals of proper purity it is questionable whether the fruit-grower would not be better served with the leading brands of arsenate of lead now on the market.

Red Oil and Crude Petroleum Oil Emulsion.—Boil 1 gallon of water and 1 lb. of hard soap sliced up, or 2 lbs. of soft soap until the soap is dissolved. Remove from the fire and add 2 gallons of the oil; replace, and bring to the boil. Thoroughly agitate until oil emulsifies. A small lump of washing soda assists the emulsifying.

If red oil, use 1 in 15, and for red scale and lecanium, 1 in 30; 1 in 10 is the strength at which crude petroleum emulsion is used for mussel scale, red spider (bryobia), and woolly aphis.

Lime and Sulphur.—Lime, 20 lbs.; flowers of sulphur, 15 lbs.; water, 50 gallons. Slake the lime in about 20 gallons of water, and add the sulphur, previously mixed up into a stiff paste, to the slaking lime. The whole mixture should be boiled for one hour in an iron kettle over a fire, keeping well stirred all the time, after which the full quantity of water may be added and then promptly applied before the sulphides are lost by cooling and crystallization. Material should be strained and thoroughly agitated. To increase adhesiveness, 2 or 3 lbs. of salt may be added.

Self-Boiled Lime Sulphur.—Lime, 10 lbs.; sieved sulphur, 10 lbs.; water, 50 gallons. Place lime in barrel and pour on enough water to start it slaking, about 6 quarts. Then add the sulphur, and finally enough water to slake the lime into a paste. Keep well stirred, and after the violent boiling ceases the mixture should be diluted ready for spraying. Five to fifteen minutes are required for the process, according as the lime is quick acting or sluggish.

Bordeaux.—Bluestone, 6 lbs.; fresh unslaked lime, 4 lbs.; water, 50 gallons. Slake the lime with a small quantity of water and then make up to 25 gallons. Dissolve bluestone in 25 gallons of water. Run evenly through strainer into third vessel. Stir well and apply with fine spray.

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Moisture—that is, water in a form that the roots of trees and plants can assimilate it—is the most important factor in the cultivation of fruit. This especially applies during the season of active growth, and the most important problem fruit-growers have to solve is to provide a sufficiency from the time the buds burst into growth in spring until the period that the growth should cease—about the end of summer or in autumn. In the hot and dry districts the remedy lies in irrigation, without which fruit-growing would be impossible. In the southern districts generally, the rainfall is sufficient, if the water is properly conserved. It is practically impossible to cultivate badly-drained soil, whether of a loose or retentive nature, in such a manner so that the moisture necessary for the general well-being of the trees will be saved. The principle of sub-soil drainage—paradoxical as it may appear—is the most important point in the question of moisture retention.

Cultivation must commence early in spring to save the water. To cultivate wet, sodden soil would certainly mean the destruction of the texture of such soil as applied to its value as a medium for supplying plants with nutriment. A soil that is comparatively poor, but in good physical condition—that is, well drained, fairly porous, yet capable of holding a fair supply of moisture—will produce fine, healthy, long-lived trees, that will bear crops of excellent fruit regularly, provided a rational systematic method of cultivation is practised. On the other hand, a soil rich in all the mineral matters that plants need for perfect growth, flowers, and fruit would, if water-logged, be positively useless. An example may be seen in the case of pot-grown plants. The plant in the properly-drained pot is vigorous and healthy, that in an ill-drained one poor and feeble, although the original specimens were identical in species, health, and strength when potted, and the soil was also identical in character and value.

Orchard land needs ploughing in spring while the soil is moist. When the surface of the ploughed soil dries it should be harrowed, rolled, or otherwise worked, as conditions dictate, to bring it to the condition of a level, well-pulverized seed bed. By no other means can the soil moisture due to the winter rains be saved for the summer needs of the trees. The earth mulch maintained by regular light cultivation in summer is correct; the reverse is seen where the soil has been ploughed when wet, a necessary condition of undrained land, or where no ploughing has been done. In light sandy or loamy soils, or in those of a gravelly or rubbly nature, trees grow into large specimens and bear fruit, even when entirely neglected; but there is no comparison between the results obtained in like soils that are properly managed. In undrained, heavy, stiff, clay soils, fruit trees fail, owing to lack of air in the soil, saturation with water in winter and spring, and an almost total absence of moisture for the rest of the year.

It should always be remembered that extra deep ploughing that will cause the destruction of roots is highly improper. It has been claimed that ploughing that will *always throw the soil towards the trees* should be regularly practised. The effect claimed is a *deepening* of the soil and consequent increase of feeding area for the roots. Very little reflection is needed to show that such incessant *deepening* of the soil between the trees means also incessant destruction of the roots, and it requires no

exceptional wisdom to realize that such practice cannot possibly be attended with beneficial results. It may cause extra-vigorous trees to fruit earlier than they would with ordinary cultural treatment, but an easier way remains in such cases, viz., not to cultivate at all. If manure is necessary, *it should be spread over the whole of the soil, excepting only near* the stem, and be ploughed in. The usual cultivation that follows will make it available for use by the trees. As the feeding roots are well away from the stems of the trees, manure and water should always be applied about the centre of the lands, not near the stems.

Various fungoid diseases are almost certain to affect apples, pears, peaches, apricots, &c., especially in the southern districts of the State. The most destructive in its effect is the Black Spot, or Scab, of the apple and pear. This disease should not be confused with Bitter Pit. In the latter case, the fruit is free from any indication of spotting until it is ripening; indeed, in many varieties of apples, it only shows some time after the fruit is picked and stored. In the case of Black Spot, or Scab, the disease shows soon after the fruit has set, and is present at all stages of its development in the form of small spots or large, scab-like patches. This explanation is necessary on account of many people failing to distinguish between the two diseases, and accordingly complaining of the inefficiency of the remedy advised in the case of Black Spot, when it is a different disease altogether that they are dealing with.

Bordeaux mixture and copper-soda wash are effective remedies, or rather preventatives, against Black Spot (*Fusicladium*), and no intelligent fruit-grower would think of avoiding the application of one or the other when his trees are about to blossom, viewing the matter as it should be viewed, in the light of *insurance* against the diseases named.

The following points are well known to experienced orchardists:—Black Spot is a parasitic fungus, *i.e.*, a low form of plant life, invading and existing in the tissues of the fruit, at the expense of the host; it is easily and cheaply prevented by the timely application of Bordeaux mixture or copper-soda wash; and the principal considerations are a properly prepared solution, and a thorough application at one particular period. *The best time to spray is when a few of the blossoms are opening* and the bulk of the flower buds are showing with distinct stems. A thorough application does not necessarily mean a huge waste of spray wash, but sufficient to cover every vegetating and blossoming part of the tree, so that when the water evaporates the parts sprayed are covered with the constituents of the wash. The formula for Bordeaux mixture is: 6 lbs. bluestone, 4 lbs. new lime, 50 gallons water. That for copper-soda wash is: 6 lbs. bluestone. 8 lbs. washing soda, 50 gallons water.

Copper-soda wash is possibly as effective as Bordeaux mixture under any circumstances. It certainly is so in districts where the weather conditions are fairly dry at the blossoming period. Bordeaux mixture, owing to the lime in it, adheres to the trees better than the other wash, and is preferred where heavy rains occur in spring. The difference in cost is that between the soda and the lime. Only positively fresh lime is serviceable, so that some waste usually ensues. The copper-soda is more easily mixed and applied, and is a much more pleasant mixture to use generally.

The accepted proper mixture for copper-soda wash is made thus: Dissolve 6 lbs. bluestone in 25 gallons water, in which it should be suspended (placed in a piece of hessian). In cold water it will dissolve in a few hours; if required quickly it dissolves in a few minutes in boiling water. Dissolve 8 lbs. of washing soda in the same manner in another

vessel containing 25 gallons water; when dissolved, add evenly together into the spray barrel. It may not be absolutely necessary to follow these directions exactly, but a mixture made on the lines indicated is perfectly safe and effective. In the case of Bordeaux mixture the only difference is that 4 lbs. of lime must be slaked, strained, and made up to 25 gallons, and afterwards mixed as in a copper-soda wash.

A strong tobacco or soft soap wash is most effective against peach aphis. One pound soap to three gallons water will usually kill the insects. In the case of tobacco wash the effective "strength" depends on the quality of the tobacco. Test it to kill before generally applying. The addition of soap causes it to spread and adhere better than it otherwise would.

COOL STORAGE OF FRUIT.

W. French, Engineer in Charge, Government Cool Stores, Doncaster.

Refrigeration is chiefly of economic importance for the following four reasons:—

(1) To prevent premature decay of perishable produce.
(2) To lengthen the period of consumption and thus greatly increase production.
(3) To enable the owner to market his products at will.
(4) To make possible transportation in good condition from point of production to point of consumption, irrespective of distance.

Cool storage is a benefit to mankind in that it allows of a greater variety of food during all seasons of the year. Health and longevity are promoted by the free consumption of fruits, and the placing of fresh fruits at the disposal of even the poorest of our citizens during every month in the year will certainly result in a wholesale benefit to mankind, so far-reaching in its effects as to be incalculable. It adds nothing to and subtracts nothing from the article preserved, not even the water, and in no material sense alters its quality. It causes no change of appearance or taste, but leaves the fruit substantially in its original condition, while it renders it neither less nutritious nor less digestible.

If the right system is installed and it is properly handled, cool storage will produce some remarkable results in the preservation of perishable products. It must not be expected, however, that the quality and condition of the goods are improved by storage. Cool storage does not insure against natural deterioration. Goods for cool storage must be in prime condition and selected by an experienced person if it is expected to carry them to the limit of their possible life. A cool storage house successfully operated and managed will supply a uniform temperature at the proper degree throughout the storage season. It will regulate the humidity at the proper point and will supply fresh air properly treated to force out the accumulated gases. The storing of unsuitable, imperfect and inferior goods has led to much misunderstanding between the man who stores the goods and the cool storage manager. Both should, if possible, be familiar with the condition of the goods they are handling, the different stages of ripeness, quality and liability to deterioration. Cool storage cannot improve the physical condition of perishable goods and is in no way responsible for damage or decay which may arise from improper picking, grading, packing, or handling before placing in the storage house. If these things are properly understood much

misunderstanding will be avoided and greater satisfaction and profit will result to everybody concerned.

A most important provision and one which should be carried out to the letter is this, that fruit should invariably be packed in open ventilated cases of *uniform* size. Loss of space and great difficulty in handling and ventilating packages have been experienced in the handling of cases of uneven size and shape.

There is a good deal of misapprehension as to the function of cool storage in the preservation of fruits. This condition leads to frequent misunderstandings which might be avoided and the condition of fruit storage improved if there were a clearer definition of the influence of fruit preservation, of cultural conditions, of the commercial methods of handling and of the methods of storage. The fruit is part of a living organism in which certain processes go forward more slowly in low temperatures, but do not cease even in the lowest temperatures in which the fruit may be safely stored. It may decay prematurely through rots caused by fungi which lodge on the fruit before it is packed and sometimes afterwards. The cool storage house is designed to arrest the ripening processes in a temperature that will not injure the fruit in other respects, and thereby prolong its life's history. It is designed also to retard the development of the diseases with which the fruit is affected, but it cannot prevent the slow growth of some of them. It follows that the behaviour of different apples or pears in storage is largely dependent on their condition when they enter the stores. If they are in a dissimilar condition of ripeness, or have been grown or handled differently, or vary in other respects, these differences may be expected to appear as the fruit ripens slowly in the low temperatures. If the fruit when stored is already overripe, the low temperatures cannot prevent its deterioration sooner than would be the case with fruit of the same variety that was in a less mature condition. If the fruit has been bruised, or is covered with rot spores, the low temperature may retard but cannot prevent its premature decay. If there are inherent differences in the fruit due to the character of the soil, the altitude, and to incidental features of orchard management, or variations due to methods of picking, packing, and handling, the low temperature must not be expected to obliterate them, but rather to retard while not preventing their normal development. Fruits for cool storage and export should be grown on well drained ground.

VARIETIES, KEEPING QUALITIES, AND TEMPERATURES.

APPLES.

Apples do not improve in grade in cool storage. In handling crop too much care cannot be given to grading properly before putting in storage. The contents of many packages are injured by the spread of diseases from a few imperfect apples. Rots enter the fruit most easily wherever the skin is bruised or broken, and in the early stages of rot development it is common to see the diseases manifesting themselves around worm holes or bruises occasioned by rough handling, from nails protruding through cases, or from other causes. The attractiveness and the value of the best fruit are often lessened by careless handling. A bruised spot dies and discolours. Finger marks made by pickers and injuries that may occur in transit of fruit all become more apparent the longer the article is stored.

An apple should be fully grown and highly coloured when picked to give it the best keeping and commercial qualities. When picked in that

condition it is less liable to scald, is of better quality, more attractive in appearance, and is worth more money than when it is picked in greener condition. An exception to this statement appears to exist in the case of certain varieties the products of rapidly growing young trees. Such fruit is likely to be over-grown, and under these conditions the apples may need picking before they reach their highest colour and fullest development. Uniform colour may be secured by pruning to let the sunlight into the tree, by cultural conditions that check the growth of the tree early in the fall, by picking the trees several times, taking the apples in each picking that have attained the desired degree of colour and size. Apples should be stored as quickly as possible after picking, especially if the weather is hot. The ripening which takes place between the time of picking and storage shortens the life of the fruit in the storage chamber. The fruit rots multiply rapidly if storage is delayed and the fruit becomes heated. If the weather is cool enough to prevent after-ripening, a delay in the storage of the fruit may not be injurious to its keeping quality.

The best fruit keeps best in cool storage. When the crop is light it may pay to store fruit of inferior grade, but in this case the grades should be established when the fruit is picked. The bruising of the fruit leads to premature decay. A variety may differ in its keeping quality when grown in different parts of the country. It may vary when grown in the same locality under different conditions. The character of the soil, the age of the trees, the care of the orchard, all are factors which modify the growth of the tree and fruit, and may affect the keeping quality of the apples. The character of the season also modifies the keeping power of the fruit. I would advise growers to wrap all varieties of apples so as to prevent wilting. It has been found that the wrapper may influence the keeping quality in several different ways. It extends the life of the fruit beyond its normal period by retarding the ripening processes. The influence of the wrapper in this regard is apparent, especially at the end of the normal storage season of the naked fruit when the flesh begins to grow mealy from over-ripeness. At this time, the wrapped apples may be firm and remain in prime condition for several weeks, or even months. The wrapper is especially useful in extending the season of early winter sorts, or in making the long keeping varieties available for use over a still longer period. The wrapper may be useful in preventing the transfer of rot from one apple to another. If the fungus is capable of growing in the storage temperature it is not likely that the wrapper will retard its growth, but when the spores develop they are confined within the wrapper and their dissemination is difficult or practically impossible.

Varieties.—Five Crown, Rome Beauty, Jonathan, Munroe's Favourite, Pomme de Neige, Shorland Queen, Stone Pippin, Dougherty, Rokewood, Scarlet Nonpareil, Buncombe, Yates, Stewart's, Morgan's Seedling and Statesman. Good results obtained from three to six months' storage. Temperature, 30° to 32° F.

PEARS.

Before the advent of the cool storage system, the supply of summer pears frequently exceeded the demand. The markets were consequently demoralized in hot humid seasons, especially as regards the early varieties; for instance, Williams' Bon Chrétien, which is a difficult pear to control owing to the rapid manner in which it ripens. It has to be sold immediately to prevent heavy losses from decay. It is absolutely essential that the greatest care should be observed in handling of the fruit, and that it be sent with as little delay as possible to cool storage after picking. All

bruised or otherwise damaged fruit, either from rough handling or through being affected by any of the many prevalent diseases associated with orchards, should be strictly kept apart for disposal to the best advantage, and should not be cool-stored. Pears should be picked and packed carefully to prevent bruising, preferably in bushel cases. If it is desired to keep pears for a long period it is necessary for them to be picked before they reach full maturity, and to be ripened in a cool temperature, say from 50° to 55° F. If the best texture and flavour are to be developed it is a matter of practical judgment on the part of growers to determine the proper time of the season for picking different varieties of pears for cool storage. The stem should at least cleave easily from the tree before the fruit is ready to pick.

Varieties.—Williams' Bon Chrétien, four to six weeks. Temperature, 32° to 33° F. This pear must be stored immediately after it is picked, in open ventilated bushel cases, and must be picked as green as possible. Doyenné Bossoch, four to five months. Temperature, 32° to 33° F. This pear improves in flavour in cool stores and is very profitable. Howell, good keeper up to four months. Temperature, 30° to 33° F.

Swan's Orange, Beurré Bosc, Marie Louise, Beurré Golden, Beurré de Capiaumont, Beurré Clairgeau, Thompson's, Bakehouse Bergamot, Broom Park, Kieffer's Hybrid, Vicar of Winkfield, Madame Cole, Winter Cole, and Bailey's Bergamot are all good keepers up to four months. Temperature 30° to 33° F.

Winter Nelis and Josephine de Malines are the two most profitable pears in cool storage, generally realizing from 10s. to 18s. per case, and will keep from six to eight months at temperatures from 30° to 32° F.

PEACHES, PLUMS, CHERRIES, &C.

Peaches.—Brigg's Red May, York, Early Crawford, Diamond, Late Crawford, McDevitt's Late Cling, Lady Palmerston, and Elberta. These peaches have been successfully stored from one to two months at temperatures from 32° to 34° F.

Plums.—The following can be successfully stored:—Diamond, Angelina Burdett, Coe's Golden Drop, Early Orleans, Late Black Orleans, Hill End, Grand Duke, Green Gage, Pond's Seedling, Reine Claude de Bavay, and Japanese.

By rigid attention to quality of fruit and providing the best facilities for cool storage, good results may be obtained for a period of from eight to ten weeks. Temperature, 32° F.

Cherries.—Cherries are quite perishable and can only be stored for short periods, from ten to fourteen days, at temperatures ranging from 32° to 34° F.

Oranges.—Will keep one to three months. Temperature, 34° F.

Lemons.—Will keep four months. Temperature, 38° F.

Grapes.—Grapes have been stored with good results for three months. Temperatures, 33° to 36° F.

Strawberries.—These may be successfully stored for a period of four weeks, if covered with cotton wool. Temperature, 32° F.

Currants.—Will keep four to six weeks. Temperature, 32° to 34° F. Red varieties keep better than black or white, and should be protected by paper covering.

Tomatoes (ripe).—Will keep from one to two months. Temperature, 42° F.

THE VICTORIAN POTATO INDUSTRY.

The Inter-State Conference and the Irish Blight.

T. Cherry, M.D., M.S., Director of Agriculture.

The outbreak of a formidable visitation of Irish Blight in New Zealand in 1904 after a slight preliminary attack in 1893, the report of a mysterious disease being present in Tasmania during the past two seasons, and the announcement that the blight was present in Queensland in May of the present year have all rendered this Department apprehensive about the condition of the Victorian potato crop. Hence, in spite of the angry remonstrances from several potato growing districts we have insisted on strict inspections as far as possible of all produce loaded in the railways whether for home consumption or for export. This inspection has revealed the widespread prevalence of eel worm disease to a greater or less extent, but it has at the same time placed us in the position of stating with confidence that Irish Blight last autumn only occurred in one small district in South Gippsland. It is to be hoped that growers who grumbled at the severity of the inspection will now see that it has proved a blessing in disguise.

As soon as the occurrence of the disease in Tasmania was officially announced, New South Wales prohibited importations from that island. In Victoria we could have done the same thing were it not that the Inter-State trade was carried on under an agreement made at the 1908 Conference of Ministers, which reads as follows :—

"That no State shall prohibit the importation of fruit, vegetables or plants exported to it from another State on account of any disease affecting such fruit, vegetables or plants which is common to both such States, provided that the exporting State has adopted and is carrying out methods to suppress or cope with such disease similar to that adopted by and being carried out in the importing State."

As the existence of the disease in Victoria was announced on the same day as that in Tasmania, we could not prohibit importations till our own area was quarantined. This was done on the 18th August and the prohibition against Tasmania issued on the same day. In the meantime, about 18,000 bags of potatoes have been landed in Melbourne.

IMPORTANCE OF THE EXPORT TRADE.

The climatic conditions of Australia make it certain that Victoria will always have many advantages which ought to give us the control of the potato supply of the Commonwealth. To say nothing of the suitability of the sandy loams and volcanic soils and the absence of pests, the distribution of the rainfall in the spring, summer, and autumn months makes the crop a comparatively certain one over large areas of the State. When the yield is below the average this is almost invariably due to the dry season. The long bright sunshine of the summer favours the activity of the living parts of the leaf in forming sugars that are transferred to the growing tubers where they are stored as starch. The absence of hot moist cloudy weather is the chief protection against fungoid diseases. Probably in no part of the world is the production of moderate crops from healthy plants a matter of greater certainty than in Victoria. On the contrary, the heavy rainfall in the potato districts of the other States while making for a big yield in a good season will also make the control of all diseases a much more difficult problem. With us the conditions which make for moderate yields are the very ones which constitute our chief safeguards against

disease. Hence, we may undertake the work of stamping out the Irish Blight with great confidence. The area affected is small; only four farms are known to have produced diseased potatoes. By taking the precautions set out below the risk of the re-appearance of the disease is lessened to a very great extent, and if the hearty co-operation of growers can be secured in reporting all cases suspicious of the disease it is quite practicable to free Victoria from this pest. As our average crop of potatoes is about 160,000 tons and its value on the farm averages £3 per ton or a total of nearly half-a-million sterling the magnitude of the interests involved is apparent. New South Wales alone imports over 60,000 tons a year, Queensland and Western Australia about 15,000 tons each. Tasmania is the chief exporting State, with Victoria a good second. No effort should therefore be spared to secure our position, and no sacrifice for one season can be too great if it leads to the permanent prosperity of one of the most important sources of our agricultural wealth. On the other hand, if we lose our export trade the potato industry is ruined, because the local demand is not nearly sufficient to maintain the present acreage under cultivation.

Not only is it recognised that soil and climate exercise a great influence upon the potato crop, but conditions which are suitable for the production of the best varieties are not necessarily the best for the production of "seed" or sets. It is the universal experience that "seed" potatoes grown in a comparatively cool climate give better results when planted in a warmer or drier climate than are obtained from locally-grown "seed." It is the knowledge of this fact which has made Tasmania the great centre for the supply of seed to South Australia, New South Wales, and Queensland. Similarly, it has been found that in several potato-growing districts in Victoria a much more profitable crop is harvested if the "seed" is obtained from one of our districts with a heavier rainfall. The length of the day in districts further from the Equator and the correspondingly increased number of hours during which sunshine is available is probably the chief cause accounting for the very high returns of tubers per acre which are frequently obtained in potato-growing countries in comparatively high latitudes. In this zone, however, potato culture is often to a considerable extent a matter of luck owing to the liability to early and late frosts. The increased profit derived from getting the new season's crop at the earliest possible moment on the large markets has led farmers to push the cultivation of the potato in many districts into areas which otherwise would be deemed unsuitable for this crop. In our own State, the Warrnambool and Ballarat potato-growing districts enjoy a considerably heavier rainfall than Lancefield, Kilmore, or the metropolitan area. It is the accidental combination of good volcanic soil with a rainfall of 30 inches or over which has led to the development of the potato industry in the three first-named centres.

So far as the distribution of Irish Blight in Australasia has been ascertained, the rainfall is in all cases over 40 inches. The progress of the disease in Queensland, to the north of Brisbane, will be watched with interest, for it has been usually assumed up to the present that temperatures above 75 degrees were unfavorable for the development of the fungus. It must be remembered, however, that in the northern States the potato season is the coolest part of the year, and as the winter temperature at Sydney averages 57 degrees, and at Brisbane 60 degrees, it is evident that the temperature of the soil, as well as the atmospheric temperatures, all through the affected districts of Queensland and New South Wales must be very favorable to the propagation of the fungus during the period when the potato crop is occupying the ground.

CONDITIONS FAVORABLE TO DISEASE.

Before dealing more specifically with the conditions necessary to cope with the present outbreak, it may be mentioned that rotation of crops is one of the most important measures that can be taken to combat all kinds of vegetable diseases. The causes of these diseases may be classified in two divisions, namely, exciting and contributing. The exciting cause is in most cases one of the lower forms of plant or animal life—a mould or fungus, as in the Irish Blight, or the eel worm, as in potato blister. In each case the individual parasitic plant or animal is extremely minute, perhaps invisible to the naked eye, while its spore or egg is of course very much smaller still. In all cases the rapidity with which multiplication takes place soon gives rise to changes in the tissues of the potato, easily visible to the naked eye, and the multitude of spores or eggs that are produced renders the diffusion of the disease a very easy matter. Contributing causes include such conditions as a weakened constitution of the seed potato, unfavorable weather for the development and vital activity of the foliage, and favorable weather for the growth and development of the fungus. The popular idea, therefore, that most of the disasters which befall crops of any kind are due to weather conditions has a considerable amount of truth in it, although, of course, if the essential or exciting cause were not present the weather alone could not produce the disaster. To put the matter in a nutshell, the contributing causes render the crop prone to disease, and make its invasion a comparatively easy matter for the micro-organisms which cause the disease; but however favorable the contributing causes may be for the onset of the disease, this cannot develop unless the specific exciting cause is also present.

It will therefore be seen that where land has been devoted for a number of years to the one crop it is highly probable that a sufficient amount of the special nutriment required by this crop will have been exhausted from the soil so that the vigour of the crop receives a check; or it may be that by growing the crop for several years in succession a slight attack of disease occurring the previous year may have infested the soil and rendered things favorable for a larger outbreak. Perhaps what most frequently happens is that successive crops have paved the way by weakening the plant, while the exciting cause is introduced by the seed which is planted in the paddock, so that a combination of the two causes is responsible for most epidemics.

When once a disease is established, its eradication becomes a matter of great difficulty. The soil may become infected, the remains of one season's crop may carry on the infection to the next year; the micro-organism may betake itself to allied plants, and it may be transferred from one district to another by all kinds of unsuspected ways. Knowledge of the life history of the exciting cause may place us on the track of the right means to prevent it, but the conditions of life of both the disease and the plant it attacks are so complicated that caution has to be exercised in drawing conclusions from any set of experiments. A farmer very often talks as if slight differences in the soil of one part of his farm, or a few weeks extra dry weather, were solely responsible for this or that result. As a matter of fact no kind of experimental work is so uncertain as that which deals with plants and animals. The difference existing between *living* and *dead* things is so profound that insignificant variations in any respect may make unexpectedly great differences in the final result. The moral of which is that no farmer can afford to neglect the smallest detail when he is dealing with any question of disease.

AN ORIGINAL ACCOUNT OF THE BLIGHT.

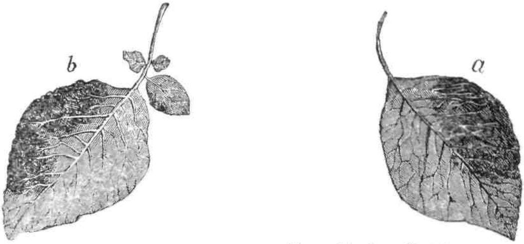
Under the title of "The Potato Murrain" the following account from the *Illustrated London News* of 29th August, 1846, is of great interest at this juncture. It often happens that the first onset of a new disease is the most disastrous—another reason why our efforts should not be relaxed:—

THE POTATO PLANT (From *Ill. Lon. News*).

"Never was witnessed a more important result, springing from a seemingly insignificant beginning, than has been presented by the disease now ravaging the potato-fields of all quarters of the earth. No one could have imagined that a rot which appeared in this crop in the island of St. Helena, in the year 1840, was the 'small speck' on the horizon which would become the forerunner of a calamity as fatal to the potato as Asiatic cholera to man; and still less that a few blotches on the leaves of this exotic plant were the heralds of political danger so extensive as to affect the whole commercial policy of England Such, however, has been the course of events, and justifies our presenting our readers with some information on this singular subject.

"The Potato plant is naturally found wild on the mountains of Chili, and perhaps of Peru, whence its cultivation has spread into surrounding countries. . . . It is said that as much as 40,000 lbs. weight of potaoes has been

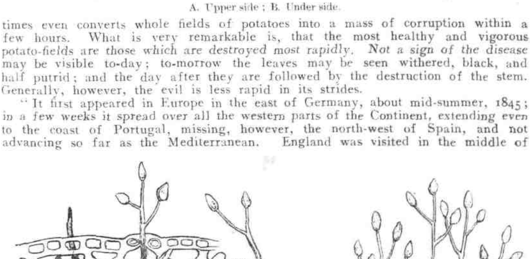
obtained from an English acre of land; this would supply a man with 10 lbs. of food a day for nearly eleven years, if he could keep it; and hence has arisen the universal desire to cultivate the plant in all countries into which it has been introduced. It now, however, seems as if Providence has determined to arrest its further increase, for it has lately been attacked by a new disease, the nature of which is unknown, which speedily destroys the hopes of the farmer, and some-



BLOTCHES ON A POTATO LEAF (From *Ill. Lon. News*).
A. Upper side; B. Under side.

times even converts whole fields of potatoes into a mass of corruption within a few hours. What is very remarkable is, that the most healthy and vigorous potato-fields are those which are destroyed most rapidly. Not a sign of the disease may be visible to-day; to-morrow the leaves may be seen withered, black, and half putrid; and the day after they are followed by the destruction of the stem. Generally, however, the evil is less rapid in its strides.

"It first appeared in Europe in the east of Germany, about mid-summer, 1845; in a few weeks it spread over all the western parts of the Continent, extending even to the coast of Portugal, missing, however, the north-west of Spain, and not advancing so far as the Mediterranean. England was visited in the middle of



THE BOTRYTIS (PHYTOPHTHORA) INFESTANS (Highly magnified).
(From *Ill. Lon. News*).

August, and for some time it was hoped that our cold northern climate would resist it; by degrees, however, it made progress, and was finally stopped only by the Highlands. In the meanwhile it reached Ireland, where, in the month of October, it had already done so much mischief that the British Government thought it necessary to send Commissioners to inquire into the facts, and to consider what could be done to arrest the progress of this murrain; for it is believed that 4,000,000 of Irish peasants feed almost exclusively upon potatoes, and the destruction of any considerable quantity of their only food could not be regarded otherwise than as a formidable national calamity. By the beginning of November, half the crop was estimated to have been destroyed, or rendered unfit for human food. On the Continent, the loss had been even more severe; so that, in many places, the

DISEASED STEM (From *Ill. Lon. News*).

export of food was prohibited; the Dutch and Belgian Governments were so much alarmed that they directed agents to purchase rice in London, and their operations were such as to double the price of that grain in a single week.

"What the amount of loss may really have been, it seems impossible to ascertain with accuracy or even probability. It has *been estimated at £18,000,000 for the United* Kingdom; Professor Lindley has computed it to have been £3,500,000 for Ireland alone.

"Whatever the past fact may have been, it is certain that the injury sustained this year is very much more considerable, perhaps twice as great, for many new districts *are attacked, no old ones are spared,* and the destruction is in all cases more extensive.

"The real cause of this sudden visitation is unknown. Some have ascribed it to the ungenial season of 1845, and that has been the prevalent idea; others have fancied that the life of the potato is wearing out; many believe in electrical agency, and talk of blue lights seen at night playing over the doomed potato grounds; insects, worms, parasitical fungi, night frosts, vegetable cholera, all have in turn had their advocates; and, as usually happens, those who have the smallest knowledge of the facts conceive themselves most capable of explaining the cause."

The illustrations which have been reproduced from the same number of the *Illustrated London News* are of striking interest for two reasons.

SECTION OF A POTATO, SHOWING THE DISEASE IN PROGRESS
(From *Ill. Lon. News*).

EARLY STAGE OF DISEASE, SHOWING CHARACTERISTIC BLACK BLOTCHES ON LEAF (from *Bull. No. 7*, 1907, N.Z. Dept. of Agric.).

The first is the accuracy of the original description of the disease as it affects the leaf and tuber, as well as the microscopic appearance of the fungus. This should be compared with similar figures in the Bulletin just issued by this Department. The second point worthy of note is the difference in the leaf of the potato 65 years ago as compared with the typical leaf taken from Bulletin No. 7 recently issued by the New Zealand Department of Agriculture. Without insisting too much on the extent of the changes which have been brought about by half a century of selection and breeding, there is no doubt that the foliage has been developed in the direction of size and denseness step by step along with the corresponding increases in the total yield per acre.

THE STEPS TO BE TAKEN.

To meet the present emergency in the potato business the hearty co-operation of every potato grower in Victoria, whether his plot is a few yards square or his farm contains 100 acres of potato land, must be secured. *No effort must be spared to stamp out the disease. A reduction in* the yield for a single year must be cheerfully borne in view of the enormous interests at stake. On an average there are 50,000 acres under potatoes in Victoria each year. Should the disease become established, spraying with Bordeaux mixture is the only method to adopt to check it, but this method will not eradicate the disease. The plants have to be sprayed when they are a few inches high, and the spraying requires to be repeated two or three times or perhaps more frequently during the growing season. The total cost works out at a minimum of £2 per acre, the maximum may be over £3. The additional cost of growing the Victorian crop will therefore be *at the very least £100,000 per annum*, but this expenditure of £100,000 does not in any way lead to an increased return similar to what might be expected if the same money were spent in fertilizers for the crop. So far as the blight is concerned it is all dead loss. Should the Victorian industry be handicapped by a yearly charge of £2 per acre there is no doubt that very many districts will have to abandon potato growing.

Such being the alternative, the following measures must be adopted :—

1st. Only clean seed should be used, and this must come from districts which are known to be free from disease. In addition to this all seed must be cut and soaked in formalin or other antiseptic.

2nd. All potatoes, *without any exception whatever*, for the next two seasons should be grown on new ground.

3rd. In future years a more systematic rotation of crops should be carried out than what has been the case up to the present.

REGARDING THIS YEAR'S SEED.

Nearly the whole of the danger of the introduction of the disease is bound up in the question of clean seed. Any seed which comes from an infected district is liable to be contaminated even if it is not itself diseased. The spores of the fungus when once an outbreak occurs on the foliage of plants are carried from plant to plant by the slightest breath of wind, and should the conditions be sufficiently moist they germinate at once, and hence from a single centre of infection the disease spreads with great rapidity. This is the explanation of the character of the disease which has impressed itself most deeply upon the popular memory in localities where it has occurred in virulent form. The common expressions—"the whole paddock was blasted in a single night;" "the crop was all right in the evening, but was all blackened next morning"—are absolute facts which are explained by the known characters of the fungus and the rate at which the spores can be disseminated over an area of several acres. Wind carriage of spores will not, however, spread disease across long distances from one locality to another, hence as the result of the Inter-State Conference it has been decided to recognise a half-mile limit as constituting the zone of practical safety. On the other hand clean seed may be contaminated by contact with diseased tubers or by being placed in the same bags as were formerly used for diseased potatoes. It will therefore be seen that the above recommendations with regard to seed potatoes, if faithfully carried out, are practically certain to stamp out the disease. Cutting the seed is another safeguard by revealing any small patches of red rust beneath the skin of the potato, which might otherwise escape observation, and while the seed potatoes are being handled watch should be kept for any softened patches. Any soft patch should be at once cut into, and if at all suspicious the potato should be thrown into a special barrel to be dealt with as indicated below. In addition to these precautions the potatoes should be soaked in a solution of formalin—1 lb. to 30 gallons of water—for a period of two hours. Before immersing in the solution, all dirt should be removed from the surface of the potato, as it is obvious that a thick coating of stiff soil will prove an effective protection from the action of the antiseptic to any patch of disease which may lie immediately beneath it. In addition to these precautions every grower who has already planted or has in his possession seed potatoes from Tasmania or South Gippsland is earnestly requested to communicate at once with the Department. If this crop is already planted it will be watched and should disease appear steps will be taken to eradicate it. As the Government has determined that a fair share of the cost of eradicating the disease will be defrayed by this Department farmers should not be held back from placing this information at the disposal of the Department in consequence of any fear of financial loss. If no disease develops no harm will be done, while on the other hand if the disease does develop they are certain practically to lose the whole of their crop even if they inform no one whatever of the fact of its existence. By means of the assistance that can be rendered by the staff of the Department it is highly probable that a farmer can be safely piloted through a dangerous period with a minimum of expense.

Rejected seed placed in the barrel *should be boiled* before feeding to pigs.

NEW GROUND FOR THIS YEAR'S CROP.

However carefully the old crop of potatoes has been dug, it is certain that many small marbles are left behind and thus constitute the danger of carrying on disease from year to year. Under favorable circumstances, every eye or even portion of an eye of a potato will sprout. If this has

touched a small piece of a diseased tuber all the conditions for the propagation of the disease may be secured. It will therefore be seen how all important it is to use new ground, particularly in a crisis of the industry such as has occurred at the present time. If we are able to prevent the disease re-appearing during the next six months Victoria is practically safe from invasion.

ROTATION OF CROPS.

The resistance of the crop to attacks of disease of all kinds is undoubtedly to a large extent measured by the general healthfulness and vigour of the stalks and foliage. In order to secure this, certain conditions have to be fulfilled. In all countries farmyard manure is regarded as being essential for the best results in potato growing on account of the changes which it produces in the condition of the soil as well as on account of the additional plant food which it adds per acre. Leguminous crops, particularly peas and clover, have also a world-wide reputation for placing the soil in the best possible condition for the potato crop. In the *Journal* for years past Mr. G. Seymour, Potato Expert, has preached this doctrine with comparatively little effect. Now that the crisis has come it is to be hoped the farmers will be aroused from the apathetic condition of considering "their old methods good enough" and make up their minds to adopt the only method which is permanently successful all the world over in growing potatoes. On the other hand, excessive amounts of farmyard manure when not balanced with corresponding increases in the phosphoric acid and potash available for the crop, and especially in seasons of heavy rainfall, may give rise to excessive growth of stalks which weaken them through overgrowth. The variations in the rainfall and soil conditions of different potato-growing districts, along with the remarks that have already been made upon the complexity of the influences which affect animals and plants, will be quite sufficient to reconcile the above advice with statements that may be read in other publications dealing with this desease that may at first sight appear to be in conflict with what is said here.

RESOLUTIONS OF THE CONFERENCE.

Transfer of potatoes from Victoria to any of the other States can only be carried on under the following conditions embodied in the resolutions of the Inter-State Conference of Ministers of Agriculture :—

1. That immediate effort to secure uniform and effective legislation be made by all States with regard to potatoes and other solanaceous plants.
2. That each State shall subdivide its whole area into districts, and take immediate steps to ascertain the extent of the prevalence of Irish Blight within its borders, with a view to quarantining all districts where the disease is found to exist.
3. That each State shall furnish the other States with a marked map, indicating by number the respective districts, and whether they are infected or clean.
4. That any declared infected district shall include an area of not less than one-half mile in width immediately within its boundaries wherein potatoes or other solanaceous plants shall not be grown.
5. That all imports of solanaceous plants (including fruit) between the States be accompanied by a certificate stating that such products have not been grown within an infected district.
6. That only new bags or cases (branded in such a way as to indicate the district in which the contents were grown) shall be accepted by each importing State.

The following resolutions were also adopted; they refer more especially to fruit and vegetables, but some of them also affect potatoes :—

7. That all fruits, vegetables and plants exported from one State to another should be inspected on their merits.

8. That no State shall prohibit the importation of fruit, vegetables or plants exported to it from another State on account of any disease affecting such fruit, vegetables or plants which is common to both States, provided that the exporting State has adopted and is carrying out methods to suppress or cope with such disease similar to those being carried out by the importing State.

9. That the inspectors stationed at Sydney by Victoria, and the one now in Victoria, sent there by New South Wales, be withdrawn, each State trusting to the efficiency, zeal and *bona fides* of the other State's inspectors.

10. That each case containing fruit, and each bag containing vegetables (including potatoes), exported from one State to another shall have stencilled upon or attached to it in some plain and permanent way either the grower's or exporter's name and address, or a mark or brand approved by and registered with the Department of Agriculture in the exporting State.

11. All destructive fruit and plant pests legislated against by the various States, with the following exceptions, shall, until otherwise notified, be deemed to be common to all the States:—Pear slug or leech (*Selandria Cerasi*), San Jose scale (*Aspidiotus perniciosus*), fruit flies (*Ceratitis* and *Tephritis*), phylloxera (*Phylloxera vastatrix*), Irish blight (*Phytophthora infestans*).

12. That in making inspection of fruit the side of each case inspected shall be removed and the fruit inspected without being tipped out of the case unless it is found necessary to do so.

13. That for the present fruit cases be of such a size as to hold two bushels, one bushel, a half bushel or a quarter bushel, the shapes of cases for the various kinds of fruit to be fixed by regulation, and to be uniform in all the States, but that early consideration be given to the question of introducing uniform legislation providing for the sale of fruit by weight or number only.

14. That all the States co-operate in a series of investigations with a view to ascertaining the origin, nature and preventive (or curative) means of dealing with bitter pit. Also, that similar co-operative work be undertaken in regard to other diseases of plants and animals.

15. That all cases used in Inter-State trade shall be new, with the exception of the South Australian trade between Adelaide and Broken Hill. In this instance all second-hand cases shall be steamed or dipped in boiling water before being used a second time.

16. That only clean bags be used for vegetables, and that no bags be used a second time for vegetables (including potatoes).

17. That fruit found to be affected with disease be allowed to be sorted or sent to jam factories under stringent regulations; if sorted all rejected fruit to be destroyed and the balance to be sent to the factory or into distribution, at the option of the chief inspector or other authorized officer.

18. That every State exporting fruit, vegetables or plants shall appoint officers to examine and inspect the same before shipment, and to give a certificate or officially stamped and signed bill of lading to the exporter that such fruit, vegetables or plants about to be shipped are fit for export. Such certificate or stamped bill of lading shall be presented with the fruit, vegetables or plants at the port of entry, and shall be accepted as far as possible as descriptive of its condition, but shall not take away the right of each State to inspect all such fruit, vegetables or plants on landing, and to reject same if found to be diseased.

19. That parcels containing fruit trees shall not exceed 200 cwt.

20. That with the exception of grape vines there shall be no restriction in the interchange of nursery stock between the States, subject to the importing State exercising its rights to inspect and fumigate same.

21. That no State shall restrict the importation of fruit (other than grapes), vegetables or plants by rail or road, but whenever one State shall make a demand for inspection of same before entry an arrangement shall be made to inspect, fumigate, &c., at a point to be mutually agreed upon, at the joint expense of the two States concerned.

22. That no State shall make a charge for inspection on imports which will return more than sufficient to meet the expenses incurred. In no case shall the charge, except for sorting or disinfecting, be more than 1d. per package or bunch, provided that the weight thereof does not exceed 56 lbs. net.

23. That unless there is evidence of disease on arrival in South Australia, fruit forwarded to Broken Hill shall be allowed to pass direct through the State of South Australia, provided that it is accompanied by a certificate of freedom from disease issued by the Department of Agriculture of the exporting State.

24. That, in the opinion of this Conference, the establishment of a Federal Bureau of Agriculture is at the present time unnecessary, and that such establishment would inevitably result in duplicating the work of the State departments.

HOME CURED BACON.

W. Smith, Pig Expert.

An essential in curing bacon is not to excite the pig before killing, but to keep him as quiet as possible. If over-heated or excited when killed, the blood will be almost black, and the flesh will also be affected.

In killing the pig, throw him on his right side by taking hold of the near or left fore-leg, still holding the leg with the left hand. Take the knife in the right hand, and cut the neck in a direct line with the chin, but not too near the shoulder. When making the cut always draw the knife after insertion back towards the chin; by doing so there will be less likelihood of shouldering.

Two buckets of boiling water to one of cold makes a very good scald (140 degrees Fahr.). As soon as the hair will come off the ears, clean them well. Then turn the pig over in the tub with back up, take all the hair from back and belly, leaving the head and feet until last. Clean the skin well in the hot water before putting cold water over the pig. Hang up as soon as possible, shave off all loose hairs, and scrub well with scrubbing brush. Open the pig down the belly and through the breast bone, clean out the inside well, lift the flares or leaf lard while the carcase is hot, so as to let the latter cool properly. Leave the pig hang in a cool place until the following morning.

The cutting up should be as follows:—If into sides, chop the pig down the backbone while hanging, then place each side on its back on a table, and remove the head. Take the breast bone off with one rib, then saw the backbone off towards the ham, take the blade bone out, and trim off all loose fat. Place the sides in a cool place, shake a little salt and saltpetre over them. Let them remain for three or four hours in order to drain, and then place the pork on a board or table slightly tilted, so that the drip will run into a dish.

For every hundred pounds of pork, ten pounds of Black Horse coarse salt, three ounces saltpetre, two pounds brown sugar, three ounces allspice are used. Rub the ingredients well in on the flesh side, placing one side on top of the other for twenty-four hours; then turn sides upside down, rub well on skin side, using liquor in dish, and leave them lying flesh downwards, the top side on the bottom. Repeat this treatment every morning for eight days, carefully saving the liquor, and pouring it over the pork as the salt is rubbed in. Then leave it for three days. Continue this process every third day for twenty-one days, and then brush the salt off and soak in cold water for sixteen hours. After this, wash out in hot water and clean well, and hang up and dry with clean cloth. When thoroughly dry, rub some olive oil on the outside skin, and smoke with kauri pine sawdust (dry) for twenty-four hours.

If it is necessary to keep the bacon for any length of time, hang it up inside a freshly emptied flour sack securely tied at the neck. This will allow the bacon to mature and keep it from the flies. The hams and shoulders can be cut off after the curing is completed.

POINTS WORTH REMEMBERING.

Do not make any unnecessary cuts in the pork. It may be thought that it will allow the salt to penetrate, but whilst that is so, it will also admit the air and cause decay. Do not neglect to turn it the required number of days while in process of curing; keep it in as cool a place as possible; be sure and fill the blade pocket with salt every time you shift the sides; rub well around the ham and the armpits.

Always use the shoulders first, as the ham and middle keep best. If you think it will be too salt, change the cold water while soaking the bacon.

EMERGENCY SILAGE MAKING.

R. Crowe, Superintendent of Exports.

The surplus fodder which will be available in all parts of Victoria during the coming spring promises to be most abundant. From present in-

FACE OF SILAGE PIT.

dications, I venture to state that, if all the carpenters in Victoria were to be engaged until harvest time in building silos, only a fractional part of the available fodder could be properly accommodated. It, therefore, appears opportune to suggest a means of conserving fodder as silage other than by the usual overground silo.

Mr. Wilson, of Hobart-road, Murrumbeena, has for the past ten years conserved green fodder in a pit on the hillside. The maize is filled in whole, and put through the chaffcutter prior to feeding. The results have been uniformly satisfactory. Judging by the condition of the silage when the photographs were taken, last season was no exception. At the time of inspection there was practically no waste.

This method has also been successfully adopted in other parts of the Commonwealth. A striking instance is recorded in the *Journal* for August, 1907. At the Euronyhareenyha Station, near Wagga, N.S.W., reserves of silage were accumulated during the good seasons, and when the drought set in a quantity, totalling 3,000 tons, was available. For over three months, 19,000 sheep and 400 head of cattle were fed almost entirely on silage. In this case the silage was made chiefly from the mix-

ture of barley-grass, and lucerne, which forms the first growth each season on the irrigated paddocks. Some of the fodder was chaffed before being put in the pits.

On thousands of farms in Victoria there are suitable sites which would readily lend themselves to this form of dealing with surplus fodder. A situation which is naturally drained should be selected. With the aid of ploughs and scoops very extensive accommodation can be provided in a few days, in some instances within a few hours. An excavation 12 feet wide by 30 feet long and 6 feet deep will hold upwards of 50 tons. When filling, the material can be heaped well above the surface. The excavated earth should be hilled up to and placed on top of the mass so as to completely cover and weight it down.

SAMPLE OF SILAGE JUST TAKEN FROM PIT.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. All inquiries must be accompanied by the name and address of the writer.

SUGAR BEET.—R.B.S. inquires as to best time to sow sugar beet, mangolds, and amber cane.

Answer.—The best time to sow sugar beet and mangolds is from the last week in August to middle of October. Amber cane can be sown towards the end of September when danger of frosts is over.

DESTROYING LICHEN.—R.S. forwards specimen of lichen for identification; and asks how to get rid of it. It especially affects Piceas and Hawthorns, and gradually appears to smother the boughs, ending in death to the tree.

Answer.—The specimen appears nearest to the lichen *Ramalina Eckloni*, Spr., but this species, though actually found in Tasmania, New South Wales, and Victoria, has not previously been recorded as Victorian. A specimen of *R. Eckloni* var. membranacea was, however, collected by Reader in 1883 near Melbourne. Spraying with Bordeaux mixture—Copper sulphate, 12 lbs.; quicklime, 8 lbs.; water, 100 gallons, might be tried to keep it down. These lichens often grow on old long

established trees, especially if they have been neglected in the past. If the Bordeaux mixture, coupled with cutting out all badly infected branches, is ineffective, dusting with a mixture of soot and finely powdered sulphur might be tried when the trees are not in leaf, or if evergreen, early in spring before growth begins.

NON-PREGNANCY OF COW.—E.T.A.W. writes:—"I have a well bred Jersey cow in good milking condition. She had her third calf about 12 months ago, and has been regularly served for the past 3 or 4 months by an Ayrshire bull with the only result that she comes in season every week. I have noticed that while in this state she emits large quantities of colourless serum."

Answer.—It is suggested that you syringe out the genital organs with a solution of lysol, 1 part in 100 parts of tepid water, every day for a week. Allow a week or two to elapse without syringing and, if no further discharge is seen, serve again. An examination of the passage might reveal some obstruction causing the trouble.

SAND IN STOMACH.—J.Y. inquires *re* symptoms of sand in horse's stomach and treatment for same.

Answer.—There are no special symptoms. Colic and general unthriftiness and signs of sand in fæces would indicate its presence. Three or four bran mashes followed by a pint of raw linseed oil should be given. Then keep the horse on sloppy food for three days and repeat the oil.

STOMACH WORMS.—H.C. asks what are the indications when horses are affected with stomach worms.

Answer.—The only reliable guide to the presence of worms is to see them in the fæces. The effect of the following powder given night and morning in a damp feed might be tried:—Sulphate of iron, 1 dr.; tartrate of antimony, ½ dr.; sulphate of copper, ½ dr.; gentian, 2 drs.

PLANTS FOR IDENTIFICATION.—B. Bros. and T.R.S. forward specimens of plants for identification. T.R.S. states that recently he put some sheep in one of his paddocks, and within a week 14 of them had died. There was no trace of disease, but portions of the weed forwarded were found in the stomachs. The sheep were removed to an adjoining paddock and no further deaths have occurred.

Answer.—(1) The specimen sent is so exceedingly fragmentary and devoid of flowers that exact identification is impossible. It is in all probability, however, a fragment of *Lepidium Draba*, L., The Hoary Cress. This plant is not poisonous, but it takes up the place of useful vegetation, and should be suppressed. Clean cultivation and the prevention of seeding aid in keeping it down. If the pasture land is badly infested it should be ploughed up and kept under bare fallow and well stirred for a year, then followed by root crops (potatoes, &c.), or a leafy fodder crop for a year or two and then grain. The land may then be seeded down in grass if required for pasture, but care should be taken to procure pure seed of either grass or grain. In small patches, it should be dug up before seeding, piled and burnt, and the roots must be removed from the soil, as any part left in the ground will grow again. In orchards or cultivated ground frequent ploughing and stirring of the soil will keep it down and ultimately exhaust it, but if it has been long established it may take two years to do this.

(2) It is a member of the Lobeliaceæ, and though in a young stage is evidently *Isotoma fluviatilis*, F.v.M. All the species of the Lobeliaceæ family contain a sharp burning or even narcotic latex, which, taken internally in excess, causes inflammation of the alimentary canal and even death. The plant should be hoed or pulled up after rain, before seeding. Stock should be kept from land where it is abundant, especially if other feed is scarce. It is easily suppressed by cultivation.

RELATIVE VALUES OF COW GRASS AND WHITE CLOVER.—R.G.P. asks which is the better feed—the perennial Cow Grass or the small white-flowering Clover.

Answer.—The small white flowered clover is termed "White" or "Dutch" Clover. It contains considerably more water than cow grass, but is richer in digestible nutrients, particularly in digestible protein. Cow grass, however, yields a much larger amount of fodder per acre, and is more palatable to stock. White clover is essentially a pasture plant. It comes away later in the season than most clovers, but once started, maintains a steady growth right on into autumn. It is hardier than cow grass and thrives better on the poorer quality of soils.

For rotation pasture or hay fields, cow grass when grown under suitable conditions is unsurpassed by any other leguminous crops with the exception of lucerne. For permanent pasturage it is good practice to sow a mixture containing both varieties of clover, as cow grass will insure a good return during the first two seasons, whilst the bottom grasses and clovers are becoming established.

LUCERNE SOWING.—J.F.A. asks which is the best time to sow lucerne seed.

Answer.—In most districts lucerne succeeds best if sown in the autumn—about April or May. Eight to twelve pounds of seed are required per acre—the lighter amount if drilled. Sow 1 cwt. superphosphate per acre with seed.

CARRYING CAPACITY OF LUCERNE.—S.P.T. wishes to know the carrying capacity per acre of lucerne when cut for hay, where 6 or 7 cuttings, each at least 2 *feet in height, can be obtained per year. He also asks whether lucerne hay* by itself is a complete food for dairy cattle.

Answer.—The carrying capacity per acre of lucerne under the conditions stated is 8 or 10 cows. Lucerne is an extravagant food by itself, but a ration along with natural pasture is excellent.

BLOAT OR HOVEN.—R.G.P. inquires whether stock are liable to bloat when turned into a paddock of alsike and cow grass.

Answer.—1. Animals are liable to suffer from bloat or hoven on either cow grass or alsike, particularly if turned into the crop when hungry or after rain or heavy dew. You will require to take the same precautions as in the case of rape feeding.

2. Horses may become affected with hoven in the same way as cattle or sheep, though they are not so subject to it It is not wise, however, to take liberties with them on this account. They should not be turned straight into the crop but should be worked on to it gradually, as in the case of other stock.

PRICE OF JERSEY BULL.—S.P.T. asks what would be a fair price to pay for a pure bred Jersey bull. Also asks what number of cows should be mated with a bull in one year.

Answer.—(1) Depends so much upon strain, &c., £25 to £30 is an approximate average. (2) 50 to 60 cows.

HARNESS DRESSING.—R.S.M. asks for formula for preparing a home-made dressing for farm harness.

Answer.—Neatsfoot oil, 1 lb.; beef tallow, 1 lb.; lamp black, 1½ ozs.

BROODY HENS.—D.J.H. inquires whether there is any way to make hens become broody.

Answer.—Much depends on the breed. The Mediterranean breeds—Leghorns, Minorcas, Andalusians, Spanish—are non-sitters. If the eggs are allowed to remain in the nest the hen usually goes broody much earlier than when they are gathered daily. Nothing you can give the hen will force broodiness. It is suggested that you go in for an incubator.

DESTROYING GRASSHOPPERS.—S.N.A. asks how to deal with grasshoppers. He has destroyed a good many by means of shallow pans of water with kerosene floating on same; he has also laid bran and arsenic, as recommended by the Government Entomologist, but this preparation was not taken freely.

Answer.—Should there be a plentiful supply of green food the bran and arsenic preparation is not readily taken by the hoppers, but green food being scarce the latter method has never yet failed Mr. French, and the insects are killed in a wholesale manner. Belts of the common castor oil plant (fenced off from stock) are an advantage, and should always be grown in grasshopper country. This plant will grow almost anywhere, and is one of the quickest growing and hardiest. Droves of turkeys, over 6 weeks old, are effective and highly remunerative, but if foxes are about they should be housed at night and tended by day. These chicks will clear large areas of hoppers and crickets in a very short space of time.

POTASSIC MANURES.—J.C. asks which is the best manure to use—sulphate of potash or muriate of potash.

Answer.—Sulphate of potash is better for vegetables, sugar beet, potatoes and tobacco. Muriate of potash may be used for all other crops. Potassic manures may be mixed with other fertilizers at any time without danger, but if mixed with lime or Thomas phosphate the mixing should be done just prior to use.

SULPHURING FRUIT.—R.G. inquires as to best method of sulphuring small quantities of fruit.

Answer.—A simple and inexpensive way of sulphuring small quantities of fruit is to take a draper's case or a large box of any kind, and place the fruit on a tray or anything on which it can be kept from the ground and above the vessel described below. Dig a shallow hole in the ground and put a vessel—an old frying-pan or billy-can—in the hole with a few live embers in it, then throw a handful of sulphur on the embers and turn the box over so as to confine the fumes as they rise. Pears require about 10 minutes, apples a little less, peaches 10 minutes, and almonds, in order to brighten the colour, may be treated for half-an-hour without injury. Flowers of sulphur are preferable as they are less pungent in their effect. Over-sulphuring is bad.

STATISTICS.

Rainfall in Victoria.

SECOND QUARTER, 1909.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	April		May		June		Total for Second Quarter, 1909.	Average for Second Quarter.
	Amount, 1909.	Average.	Amount, 1909.	Average.	Amount, 1909.	Average.		
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	311	220	341	281	491	354	1,143	855
Fitzroy, Eumerella, and Merri Rivers	353	250	397	315	502	371	1,252	936
Hopkins River and Mount Emu Creek	264	212	318	253	384	303	966	768
Mount Elephant and Lake Corangamite	243	209	324	241	392	268	959	718
Cape Otway Forest ..	415	326	434	399	673	450	1,522	1,175
Moorabool and Barwon Rivers	258	221	341	229	428	257	1,027	707
Werribee and Saltwater Rivers	186	212	332	202	301	239	819	653
Yarra River and Dandenong Creek	370	327	364	302	503	363	1,237	992
Koo-wee-rup Swamp ...	378	323	247	312	504	371	1,129	1,006
South Gippsland	369	417	320	311	717	412	1,406	1,140
Latrobe and Thompson Rivers	346	311	226	281	682	358	1,252	950
Macallister and Avon Rivers	116	186	123	146	578	234	817	566
Mitchell River	99	248	136	232	586	265	821	740
Tambo and Nicholson Rivers	79	189	84	183	668	225	831	597
Snowy River	114	254	102	287	798	369	1,014	910
Murray River	214	154	301	172	376	264	891	590
Mitta Mitta and Kiewa Rivers	502	216	316	304	845	508	1,663	1,028
Ovens River	492	237	490	330	664	532	1,646	1,099
Goulburn River	330	194	467	240	455	344	1,252	778
Campaspe River	210	178	513	236	382	306	1,105	720
Loddon River	165	154	404	179	296	246	865	579
Avon and Richardson Rivers	141	133	278	172	365	217	784	522
Avoca River	157	144	340	173	305	216	802	533
Eastern Wimmera	192	155	317	232	373	305	852	692
Western Wimmera	193	179	233	215	368	259	794	653
Mallee Country	106	120	263	149	259	176	628	445
The whole State	231	183	323	214	296	280	850	677

H. A. HUNT,
Commonwealth Meteorologist.

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TRAINING BOYS AT THE VITICULTURAL COLLEGE, RUTHERGLEN.—A SOCIAL EXPERIMENT.

G. H. Adcock, F.L.S., Principal.

A few years ago, with a view of utilizing the unoccupied buildings at the Viticultural College, and at the same time benefiting the State wards, a bold and novel experiment was made by the Victorian Department of Agriculture. This was the sending of a number of these lads to be trained in the various branches of rural work on the land attached to the

VITICULTURAL COLLEGE, RUTHERGLEN.

College. Boys of good character, who had attained the age of fourteen years, and who had an inclination for "going on the land," were selected by the Neglected Children's Department and sent up to undergo a course of training in viticulture and agriculture till they reached the age of eighteen years, when State control ended.

The work has now been in operation sufficiently long to enable some idea to be formed of its value and possibilities, and, at the request of the Director of Agriculture, this brief outline is submitted for the information of those who are interested in social experiments of the kind.

The least pessimistic amongst us cannot but see that, if allowed to congregate in the larger centres of population, without any definite aim in life, many of this class of lad would drift eventually into the ranks of the unemployed, even if they did not become associated with the criminal class. The value to the community of each life wisely diverted from such careers cannot be too highly estimated. The stability of a nation depends as much or more on its realization of a high ideal of citizenship as on its naval supremacy or military prestige. The latter insure safety from foreign invasions, but in the elevation of the individual, the training in useful productive occupations, and the formation of characters, we are rendering the future our debtors, and helping to raise the already high standard of our nation.

When we remember that the boys of to-day will be the citizens of to-morrow, we are sure no effort will be begrudged that will insure for the next generation of citizens men of "flexile muscles and obedient sinews," trained as expert and up-to-date agriculturists, and having characters and aspirations of the highest. To produce from the raw and somewhat unpromising material with which we have to deal, men with characters of the highest integrity, and workers with skilled hands and intelligent training, was the object of starting this institution on its present lines. Whether the hopes of those responsible for the innovation have been realized, let those who have seen what has been done testify.

As may be imagined, the disappointments attending such work as we undertake are manifold and keen. But the successes, of which we have had our share, far outweigh them, and, while more than compensating us in the present, give us glowing hopes for the future. To gain the confidence of some of these lads is a task that at first seems insuperable. Many of them are veritable Ishmaels, who regard every man's hand against them, as they are against every man. A kind word or act is at first looked on with the suspicion that something to be shunned is at the back of it. Every lad is a law to himself. They represent all kinds of training and lack of training. We must have as many methods as we have boys. To expect all to fit Procrustes' bed is still as disastrous to individuality as it was to stature in the mythical old brigand's day.

It is proposed to give some account of the development of these boys in the physical, educational and moral aspects.

PHYSICAL.

We are fortunate in having, as our medical officer, Dr. Bush, whose practical sympathy with our work is only surpassed by his professional skill and attention. To avoid the introduction of communicable diseases, each boy is taken for a thorough medical overhaul before coming out to the College. The results of these examinations often reveal hidden and unsuspected defects which it is desirable should be known before the lad is set to work. The chief weaknesses exposed by the medical examination are the faulty development and poor nutrition of the majority who are sent to us. The following descriptions are from the doctor's official reports:—"Anæmic"; "development poor"; "very small, undersized boy"; "very poorly developed"; poor nutrition"; "nutrition only fair"; "enlarged heart"; "heart weakness"; "spine curvature"; &c., &c. It seems sad

that in our land of plenty there appear to be so many youths who are not sufficiently well-nourished. It certainly does not augur well for the stamina of the future that this is so. Here, however, the change is rapid and complete. Regular habits and abundance of wholesome food, healthy surroundings and out-door occupations, soon work wonders. The anæmic look is replaced by the ruddy glow of health. Weight, height, and chest measurement rapidly increase. Physical development, previously arrested, is now rapid. The following table, compiled from the medical reports, gives actual increases :—

Name.	Age.	Height.	Weight.	Chest.		Biceps.	Remarks.
				Inspire.	Expire.		
	Yrs. mts.	*Ft. in.*	*Stns. lbs.*	*Inches.*	*Inches.*	*Inches.*	
A	14 7	4 8½	4 12½	27¼	25	7	Very poorly developed.
	16 11	4 11¾	7 0	30	27	7¾	Very much improved.
B	14 11	5 2½	7 7	31½	28	8½	General development poor.
	17 3	5 7¼	10 3	36¼	32¾	10	Very considerable and marked improvement.
C	14 0	4 5	5 0	25¼	23	7¼	Healthy, properly developed boy.
	15 11	4 11½	7 9	29	27	8½	General improvement.
D	14 2	4 7½	5 6½	28	25½	7½	Apparently a healthy boy.
	16 1	5 0	7 11	31¾	29¾	8¾	General improvement.
E	14 2	4 11¼	6 8	30¼	27½	8¼	Well nourished.
	16 1	5 4	9 6	36½	33	10½	Considerable improvement.
F	14 1	4 8¾	6 6	29	26	8¼	Development and nutrition good.
	15 10	5 1¾	8 7	32¼	30¼	9¼	General improvement.
G	14 3	4 11	5 12	28	25	7¼	Very thin and nutrition poor.
	15 0	5 0¼	6 10	29¼	26	7½	General improvement.
H	14 0	4 8½	5 8	27½	25½	7½	Poor nutrition and muscular development.
	15 0	4 10	6 11	29¼	26¼	8	Much improved.
I	16 5	5 4¼	8 5	31½	28¼	9	Good conditioned, healthy boy.
	17 6	5 5¾	8 11	33½	30¼	9	Much improved.
J	14 6	5 4¼	8 1	31½	29½	8½	Poor chest development. Muscular development fair. Curvature of the spine.
	15 7	5 5¾	8 12	32¾	30	9	Improvement in general health.
K	14 0	5 0½	7 0	29¾	27	8	Good nutrition with fair muscular development.
	15 0	5 3¾	8 2	31¾	28½	8½	Much improved.
L	14 0	4 11½	7 1	29¾	27	7½	Nutrition good, muscular development fair.
	15 0	5 3½	8 9	32	28½	8¼	General improvement.

Of the boys originally sent, only particulars regarding height and weight were recorded. These lads show the greatest development, but for the sake of uniformity they are omitted from the table, and only those names are included of which all the measurements can be furnished.

Each boy has a separate room, and is provided with equipment of the very best. The taste displayed by some in the adornment of their rooms is remarked by every visitor.

Everything possible is raised on the place. The meat, dairy produce, fruit and an unlimited supply of fresh vegetables are grown. Over a ton of jam is made and consumed on the place each year.

Education and Practical Training.

The boys are carefully trained in all the multifarious operations undertaken on the College vineyard, orchard and farm, and at the Wahgunyah Nursery.

That the training given by Mr. H. Wilkinson, the foreman, in grafting is satisfactory may be inferred from the excellent work the lads turn out. Several of them are each at the present time turning out 1500, 1300, 1200 and over 1000 first-class grafts a day. Under the same efficient guidance they learn the practical viticultural and horticultural work. In all branches

they take their part, and very rarely is a complaint made of indifferent service or indolence. They take a pride in their work, and their immediate supervisor while at outside work speaks well of their efforts.

The dairy branch, which has evoked considerable praise from visitors, is managed by two lads under the expert supervision of Mr. P. R. Brooke, the farm manager, who also instructs the students in practical husbandry.

GRAFTING RESISTANT STOCKS.

Besides the practical work, which is a prominent feature in the College curriculum, the theoretical and technical parts are not overlooked. Regular lectures are given dealing with the scientific aspects of the particular work in hand. The microscope and optical lantern are freely used in illustrating the various topics. Essays written on these addresses show the grasp each

GRAFTING SHED AND GRAFTERS.

student has of his subject. Prizes are annually awarded to stimulate efforts to excel, and highly creditable indeed are both the theoretical and practical work submitted. The Director of Agriculture, who, from its inception, has taken the keenest interest in the work, always comes up—often at considerable personal inconvenience—to award the prizes gained.

General educational facilities are also granted, and the boys are encouraged in every possible way to become well-equipped for their after life. The education and supervision of the lads during the evenings are undertaken by Mr. Geoffrey Egg, House Master; and no one better fitted in tact and attainments for this onerous and responsible position could well be found.

Do the lads appreciate all that is being done for them? Perhaps not now. Gratitude is never a glut in the market anywhere; but, judging from letters received from "old boys," gratitude is aroused and appreciation expressed, when the value of their training shows itself in after life.

MORAL IMPROVEMENT.

An important feature of the institution is the endeavour to uplift the lads and form their characters. The moral atmosphere by which we try to surround them begins to tell. The inculcation of the highest ideals, the development of the best in character, quickly influence some, more slowly others, while a few seem unresponsive. Generally, however, the improvement is noticeable. The boy will soon look you for the first time straight

NURSERY BUILDINGS, WAHGUNYAH.

in the face. The evolution of the "man" has begun. The one who formerly went about his work listlessly or sullenly, regarding it as drudgery, now takes a pride in it. He rapidly picks up new methods and intelligently employs them. The aptitude that might have developed him into a skilful pickpocket is turned to nobler ends, and a skilled and intelligent workman is in the making.

Too much praise cannot be given to the members of the Rutherglen Ministers' Association, who regularly visit the College and conduct services. Their splendid voluntary help is greatly appreciated.

Entertainments are frequently provided. We are under lasting obligations to many friends who provide interesting and instructive evenings in the form of lectures, concerts, and general entertainments. These brighten up the boys' lives materially. We have an excellent lantern, and this is frequently called into requisition to provide instruction or amusement, or both. Without fear of contradiction, we can assert that no lads are better looked after, or catered for, physically, morally or mentally, than the wards of the State at the Viticultural College.

There are unbounded possibilities for these lads. Many are doing well in various parts. As soon as a boy's time is up, a position is secured for

him, and as far as possible touch is kept with him after he has left the College. Letters are regularly received from a number who are proud to correspond with the principal of their old school, and who express their appreciation of the help they received there—help that has equipped them for their present positions. Of course, of some but little is heard. If they are grateful they do not express it! One mother writes to thank us heartily for what we have done, and says of her son that through our training "he is all I could wish him to be." Another mother writes: "I am very thankful to the State for their kind attention to my son." An employer who had a boy from us says: "A is doing very well, being steady and reliable. He shows in many marked ways the results of the careful and methodical training he has received." Perhaps a better tribute even than this is an application from the same district for a similar boy. Many other letters might be quoted did space permit.

It is gratifying to know that so many influential persons take a keen interest in the work here. Our visitors include His Excellency Lord Northcote, late Governor-General; and His Excellency Sir Reginald Talbot, former State Governor. We have also been favoured with visits from Ministers of the Crown, members of the Federal and State Legislatures, and very many Inter-State and other visitors. All have left on record their appreciation of the work in hand.

Though the work is extremely difficult and anxious, yet we are greatly encouraged by the successes achieved, and buoyed up by the fact that every officer of the Agricultural Department gives us appreciative and sympathetic support. Though much has been done, yet much more remains to be accomplished. We have by no means reached our ideals, which we purposely raised high. The public may be assured that there will be no relaxation of efforts; but that this work, having been once taken in hand, will not be allowed to drop while we have with us the "boy problem" as represented in the ranks from which we draw our students.

COLLEGE MILKING SHED AND SILO.

THE FRUIT EXPORT TRADE TO THE UNITED KINGDOM AND EUROPE.

Review of Season, 1909.

Ernest Meeking, Inspector under the Commerce Act.

The average result of last season's export of fresh fruit, like that of the preceding year, is unfortunately one in which realization has fallen considerably below anticipation. Prior to the commencement of the season, everything seemed to justify the belief that a larger quantity of fruit would be exported than had been shipped during any previous year, and that prices would probably equal those obtained in 1907. The former expectation was fully realized, as the quantity shipped was far in excess of that ever before sent forward, and exceeded last year's exports by no less than 98,340 cases. The figures for the two years are as follows:—

1908 ... 82,856 cases. | 1909 ... 181,196 cases.

The belief that high prices would be obtained was unfortunately not borne out by results, as these were far from satisfactory.

The figures quoted above speak in more eloquent terms than any which it is possible to convey to paper, of the pluck and determination of our exporters who stuck to the business despite their experiences of the previous year. Even the hardiest, however, must perforce quit the business unless the odds against them are much shortened. Many growers, traders and others who came into the trade with the intention of staying, and who risked capital, labour and time in the enterprise, make no secret of the fact that they are thoroughly disheartened, and openly state their intention of discontinuing unless some of the disabilities under which the trade at present labours are removed. The pity of it all is that the chief sufferers are those men who, by the hard work, in season and out, incidental to the occupation of fruit raising, make the export of fruit possible. However unsatisfactory the condition in which the growers' products arrive on the market, and however low the prices they receive, the charges on those products (freight, commission, &c.), like the laws of the Medes and the Persians, are unalterable. Above all, these are always exacted even if those who collect them are largely responsible for the unsatisfactory results.

It is not overstating the case to say that the fate of this trade, which within the past nine years has increased over 1,500 per cent., is now trembling in the balance. Another knock similar to those it has received during the past two years would in all probability give it its quietus. Even without such a contingency the checks already received will, perhaps, give it a serious set back. It is much to be feared, however, that future seasons *will* witness a repetition of the disasters which have occurred, unless attempts are made to abolish many of the causes which render the export of fruit an unprofitable business. This article will attempt to show that some of these causes at least are preventable, and will endeavour to point out the methods by which such prevention may be effected.

The chief objects at which the fruit exporter should aim in order to make his business successful are to place his fruits on the market at the lowest practicable cost, and to obtain the highest possible prices. The principal items which make up the total cost in fruit exporting are, materials (cases, wrappers, &c.), labour, rail and boat freights, wharfage, commission, &c. These charges, in conjunction with deterioration of fruit

during transit and inefficient methods of placing the fruit on the market, are the chief factors in narrowing the margin of profit available to the exporter. The freight at present charged is 65s. per ton (40 cubic feet measurement per ton). This works out at about 1s. 10d. per case. In comparing these rates with those charged on other products—butter, meat, and rabbits—and taking into consideration the relative values of the different products, we find that they are very high—butter 2s. per case, meat ½d. per lb., rabbits 1s. 7d. per crate.

It may be argued, in extenuation of the higher rate charged for fruit, that this product, by reason of its susceptibility to fluctuations in temperature, requires much more care and attention than other perishable products. This is in a large measure true; but it is not true to the extent that is popularly believed. It is usually thought, for example, that if the temperature falls below 32 degrees Fahr., irreparable injury will occur to the fruit. According to experiments carried out locally, and by the results of tests in the United States of America, fruit may be kept for a long period at temperatures 1 or even 2 degrees lower than the one mentioned, and, provided the temperature is not permitted to rise too rapidly, no injury will occur. At what exact temperature the moisture contained in fruit cells will freeze has not been definitely determined; but it appears certain that it is below 31 degrees Fahr. It is not safe, however, to store fruit below this temperature. Fruit may be refrigerated until it is covered with frost; but, provided it is allowed to defrost and is not rushed from the freezer into a temperature many degrees higher, no injurious effect will result. The writer has made experiments with apples, oranges and pears stored at a temperature of 29 degrees Fahr. for six weeks and in every instance when the temperature was permitted to rise slowly to 40 degrees Fahr., the fruit kept its colour and remained in a marketable condition. The reverse was the case when the fruit was at once removed into a higher temperature. When this was done, discolouration took place rapidly, rendering the fruit quite unmarketable in a few hours. According to Bulletin No. 48 of the Department of Agriculture, U.S.A., this is explained by the fact that when fruit is frozen, the cell moisture is withdrawn into the intercellular spaces. When the fruit is thawed slowly, the cell has sufficient time to regain its moisture; but if thawed too quickly the cells cannot regain the water with sufficient rapidity. It therefore remains in the intercellular spaces and disappears by evaporation. The cells then collapse for want of moisture and so perish.

Among the fruits mentioned as having been locally experimented with, were some oranges in a fairly advanced stage of decay from the effects of either *Pencilium digitatum*, or *P. glaucum;* and some apples badly affected with Bitter Pit. On removal, after some six weeks at 29 degrees Fahr., both oranges and apples were in much the same condition as when placed in the chamber, the decay caused by the diseases having made but slow progress. Within a few hours after removal, however, the oranges were completely decayed and the apples were in a like condition within three days. It seems a fact, therefore, that moulds and decay from whatever cause arising (including Bitter Pit) develop with exceeding slowness at temperatures in the immediate vicinity of the freezing point of water; but advance with proportionate rapidity for each degree of temperature above the one mentioned. This is probably the chief reason why our fruits arrive at their destination so badly decayed through the effects of Bitter Pit developed during transport, as the records given at the head of the shipments quoted in the following list show that fruit was carried

in most instances at temperatures far higher than those which experiment has demonstrated to be the most suitable for retarding the advance of decay.

The few facts above quoted of course traverse but a small portion of the problem connected with the successful transport of fruit. The growers and exporters themselves in many instances may not be wholly free from blame in the matter of their fruits arriving on the oversea markets in an unsaleable condition. The prevalence of Bitter Pit does not altogether account for the large percentage of decay which occurs. Much of this is undoubtedly due to injuries which occur to the fruit during its pre-shipment handling. The want of up-to-date methods in cooling fruit prior to shipment, caused by lack of cool storage accommodation in the various fruit-growing centres, and the dearth of ice-car transport on the rail, must also bear their share of the responsibility. However, the fact that Bitter Pit development "en voyage" *does* largely take place, and that its presence in our fruit is the chief cause of decay during transport, seems quite established. Therefore, the matter of transporting fruits at lower temperatures than hitherto should receive prompt attention by the various shipping companies. The discovery of a remedy for Bitter Pit may not eventuate for years; but, in the meantime, its evil effects on our fruit export trade may be greatly mitigated by adopting the practices outlined above.

A pleasing feature of this season's trade has been the large increase in the export of cases manufactured from locally-grown hardwood timber. These cases, besides giving local employment to many timber getters, sawmillers and others, possess the additional recommendations of costing but little more than half the price of soft-wood cases and being in some respects more efficient as they afford better protection from external pressure and injury by reason of their greater rigidity. The following are the relative quantities of the two kinds of cases exported:—

Hard-wood cases	71,550.
Soft-wood cases	115,020.

These figures include cases exported to South Africa and other oversea countries not mentioned in this report.

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
Per *Mooltan* (London), sailed 16th Feburary (Arrived in good condition. No record of temperature.)							
APPLES.							
Adams' Pearmain	205	12	6	10	0	11	6
Allan Bank ..	10	10	6	10	6	10	6
Annie Elizabeth ..	178	12	0	10	0	11	2
Australian Star ..	32	10	6	10	6	10	6
Blenheim Orange ..	5	10	6	10	6	10	6
Chronicle ..	4	10	6	10	6	10	6
Cleopatra ..	1,553	15	0	9	9	10	9
Cox's Orange Pippin	327	15	0	9	3	12	0
Dumelow's Seedling	246	13	0	9	9	10	9
Emperor Alexander	28	7	9	7	3	7	6
Fearn's Pippin ..	4	12	0	12	0	12	0
Gravenstein ..	68	10	0	8	6	8	11
Hubbardston's Nonsuch	21	10	6	10	6	10	6
Jonathan ..	1,179	14	0	8	9	12	1

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
Kentish Fillbasket	21	10	0	10	0	10	0
King of Pippins ..	82	13	6	9	0	11	1
Munroe's Favourite	592	12	6	10	6	11	4
Norfolk Beaufin ..	1	9	3	9	3	9	3
Pomme de Neige ..	23	11	0	9	6	10	3
Prince Bismarck ..	100	10	6	9	3	9	10
Purity	18	10	6	10	6	10	6
Reinette de Canada	142	10	6	9	3	9	5
Ribston Pippin ..	153	13	0	8	0	10	2
Rome Beauty ..	48	11	0	9	6	10	0
Winter Permain ..	38	13	0	10	6	11	0
Winter Queen ..	8	10	6	10	6	10	6
Various	37	12	0	9	3	10	5
Slack Cases ..	38	11	0	3	6	4	4
PEARS.							
Beurré Clairgeau ..	9	6	9	6	9	6	9
Beurré d'Anjou ..	28	14	0	10	0	13	0
Vicar of Winkfield	36	12	6	8	0	12	3

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.

Per *Oroya* (London), sailed 23rd February.

(Arrived in not very good condition. Many apples spotted and soft. Pears were good. Temperature, 38 to 55 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adams' Pearmain	114	11	0	10	6	10	7
Allan Bank ..	2	9	6	9	6	9	6
American Mother ..	5	10	6	10	6	10	6
Annie Elizabeth ..	79	11	6	9	3	11	3
Cleopatra ..	954	12	6	7	0	8	8
Cox's Orange Pippin	79	15	6	10	0	12	6
Dumelow's Seedling	117	15	6	9	0	11	0
Esopus Spitzenberg	4	12	6	12	6	12	6
Jonathan ..	1,783	12	6	8	3	11	6
King of Pippins ..	9	10	0	9	9	9	11
London Pippin ..	271	10	6	8	3	9	0
Lord Wolseley ..	19	7	6	7	6	7	6
Muller's Spitzapfel	17	9	6	9	6	9	6
Munroe's Favourite	703	13	6	7	9	9	5
Perfection ..	6	10	0	10	0	10	0
Pomme de Neige ..	62	9	6	9	3	9	5
Prince Bismarck ..	81	10	0	7	3	9	3
Purity	12	8	6	8	6	8	6
Reinette de Canada	210	9	6	8	6	9	2
Ribston Pippin ..	128	11	6	7	9	9	6
Rome Beauty ..	244	10	0	7	6	8	9
Rymer	68	9	0	7	0	8	0
Scarlet Nonpareil ..	24	8	9	8	6	8	7
PEARS.							
Beurré Clairgeau ..	1	24	0	24	0	24	0
Beurré de Anjou ..	33	24	0	19	0	21	0
Beurré de Capiaumont ..	6	10	0	9	6	9	10
Beurré Diel ..	1	19	6	19	6	19	6
Broom Park ..	9	13	0	13	0	13	0
Napoleon ..	5	13	0	13	0	13	0
Uvedale's St. Germain ..	7	10	6	10	6	10	6
Vicar of Winkfield	63	16	6	12	0	13	6

Per *Friedrich der Grosse* (Germany), sailed 23rd February.

(No record of temperature or condition of fruit.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adams' Pearmain	3	6	0	6	0	6	0
Alfriston ..	25	9	9	9	9	9	9
Blue Pearmain ..	11	15	6	15	6	15	6
Cleopatra ..	359	15	3	9	3	13	6
Jonathan ..	141	13	6	6	9	10	2
London Pippin ..	32	9	9	9	9	9	9
McLean's Favourite	67	9	6	7	6	8	8
Munroe's Favourite	146	13	3	5	0	8	0
Norfolk Beaufin ..	21	6	0	6	0	6	0
Peasgood's Nonsuch	6	11	9	11	9	11	9
Reinette de Canada	100	13	9	9	0	13	0
Ribston Pippin ..	7	6	0	6	0	6	0
Rymer	5	7	0	7	0	7	0
Purity	21	11	9	11	9	11	9

Per *Orestes* (London), sailed 26th February.

(Apples and pears fair condition only. Temperature, 40 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Annie Elizabeth ..	83	10	6	8	0	9	0
Cleopatra ..	451	11	0	8	9	9	6
Cox's Orange Pippin	19	15	6	10	0	14	0
Dumelow's Seedling	94	12	6	10	0	11	9
Esopus Spitzenberg	5	9	3	9	3	9	3
Jonathan ..	1,187	12	6	8	0	11	6
King of Pippins ..	98	9	9	9	3	9	5
London Pippin ..	217	10	0	7	9	8	8
Munroe's Favourite	475	11	6	8	0	10	0
Newtown Pippin ..	4	9	3	9	3	9	3
Prince Bismarck ..	6	9	3	9	3	9	3
Reinette de Canada	269	9	3	6	9	7	11
Ribston Pippin ..	3	9	9	9	9	9	9
Rome Beauty ..	36	9	0	9	0	9	0
Rymer	70	9	6	8	6	9	3
PEARS.							
Beurré Clairgeau ..	17	14	0	8	0	9	2
Beurré Diel ..	5	14	6	14	6	14	6
Broom Park ..	5	14	6	11	6	12	8
Eyewood	14	16	6	15	6	16	0
Josephine ..	20	8	6	8	0	8	5
Vicar of Winkfield ..	100	17	3	11	6	13	9
Winter Nelis ..	10	21	9	15	0	21	1

Per *China* (London), sailed 2nd March.

(Fruit, fairly good condition. Temperature, 38 to 41 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adams' Pearmain	41	11	0	9	0	9	8
Allan Bank ..	14	9	6	9	6	9	6
Annie Elizabeth ..	10	10	0	10	0	10	0
Ben Davis ..	46	9	3	7	9	8	4
Cleopatra ..	332	13	0	8	3	10	9
Cox's Orange Pippin	36	12	0	11	0	11	1
Dumelow's Seedling	14	12	6	9	9	10	10
Esopus Spitzenberg	11	9	0	9	0	9	0
Hoover	12	9	3	9	3	9	3
Jonathan ..	590	13	6	8	3	11	5
King of Pippins ..	4	12	0	12	0	12	0
London Pippin ..	580	10	6	8	0	9	8
Magg's Seedling ..	2	8	0	8	0	8	0
Munroe's Favourite	379	12	0	9	6	10	10
Newtown Pippin ..	26	9	6	9	0	9	3
Nickajack ..	30	8	9	8	2	8	4
Pomme de Neige ..	5	9	3	9	3	9	3
Prince Bismarck ..	23	9	3	8	9	9	1
Reinette de Canada	154	9	9	7	0	8	5
Ribston Pippin ..	19	11	6	11	6	11	6
Rome Beauty ..	197	10	0	7	6	9	3
Rymer	35	9	3	9	0	9	2
Scarlet Nonpareil ..	81	10	0	6	6	7	6
Stone Pippin ..	79	8	3	8	0	8	1
Sturmer Pippin ..	19	8	3	6	6	7	5
Yapeen Seedling ..	24	9	9	9	3	9	5
PEARS.							
Broom Park ..	22	18	0	15	0	15	9
Eyewood	35	17	6	13	6	15	11
Le Conte	2	25	0	25	0	25	0
Vicar of Winkfield ..	135	18	6	7	3	14	1
Winter Nelis ..	8	19	0	19	0	19	0

Per *Miltiades* (London), sailed 4th March.

(Fruit hard and dry condition. Temperature, 36 to 40 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Annie Elizabeth ..	173	9	3	7	6	7	11
Baldwin	12	7	0	7	0	7	0
Ben Davis ..	24	7	0	7	0	7	0
Cleopatra ..	1,081	11	0	7	9	8	3
Cox's Orange Pippin	89	18	0	9	0	11	0
Esopus Spitzenberg	14	9	0	7	0	7	10
Fearn's Pippin ..	4	9	0	9	0	9	0
French Crab ..	46	7	9	7	6	7	7
Gooseberry Pippin	4	7	6	7	6	7	6
Hoary Morning ..	7	8	6	8	6	8	6

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
Hoover	53	8	9	7	9	8	3
Hubbardston's Non-such	5	9	0	9	0	9	0
Jonathan ..	1,899	11	6	6	3	9	6
London Pippin ..	830	9	0	7	9	8	4
Luscombe's ..	2	8	0	8	0	8	0
Munroe's Favourite	1,523	10	6	8	0	9	6
Newtown Pippin ..	7	7	3	7	3	7	3
Perfection ..	83	8	3	6	3	7	4
Pomme de Neige ..	29	8	0	7	6	7	9
Prince Bismarck ..	4	7	6	7	6	7	6
Purity	32	8	0	8	0	8	0
Reinette de Canada	438	9	6	6	9	7	7
Rome Beauty ..	111	9	0	6	9	7	6
Rymer	42	9	3	8	0	8	11
Schroeder ..	3	7	6	7	6	7	6
Statesman ..	5	9	0	9	0	9	0
Sturmer	64	9	9	7	6	8	4
Stettin Rouge ..	12	8	9	8	9	8	9
Stone Pippin ..	126	8	6	7	3	7	10
Wellington ..	82	10	0	8	6	9	6
Winter Strawberry Pippin ..	3	9	6	9	6	9	6
Various	26	7	6	7	6	7	6
PEARS.							
Beurré Bosc ..	2	5	0	5	0	5	0
Broom Park ..	6	7	6	7	6	7	6
Eyewood.. ..	16	14	0	7	0	9	7
Vicar of Winkfield	84	16	6	7	3	9	8

Per *Oberhausen* (Germany), sailed 6th March.

(Apples, many affected by Bitter Pit. Pears, good. No record of temperature.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
Adams' Pearmain	18	12	0	11	3	11	9
Alfriston ..	5	7	0	7	0	7	0
Ben Davis ..	18	8	6	8	0	8	5
Cleopatra ..	251	13	6	7	9	10	7
Cox's Orange Pippin	47	10	6	10	6	10	6
Esopus Spitzenberg	65	11	0	9	0	9	10
Hoover	25	8	3	7	0	7	5
Jonathan ..	1,986	15	0	8	0	10	4
London Pippin ..	706	12	6	7	0	9	10
Munroe's Favourite	577	14	0	8	0	11	5
Newtown Pippin ..	12	8	3	8	0	8	2
Northern Spy ..	3	8	6	8	6	8	6
Perfection ..	50	11	3	8	3	10	5
Prince Bismarck ..	23	8	6	8	6	8	6
Pomme de Neige ..	12	8	6	8	6	8	6
Reinette de Canada	680	10	9	6	3	9	2
Rhode Island Greening ..	74	8	0	8	0	8	0
Rome Beauty ..	94	10	0	7	6	8	6
Rymer	29	9	3	9	3	9	3
Stone Pippin ..	31	8	0	7	0	7	8
Sturmer Pippin ..	86	11	6	7	3	10	1
PEARS.							
Beurré d'Anjou ..	20	25	6	25	6	25	6

Per *Ortona* (London), sailed 9th March.

(Apples, good. Pears, very good. Temperature, 38 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adams' Pearmain	4	*6	0	6	0	6	0
Cleopatra ..	179	10	6	8	0	9	3
Cox's Orange Pippin	10	*6	0	6	0	6	0
Esopus Spitzenberg	10	10	6	8	6	10	1
Jonathan ..	308	11	0	*5	6	8	6
London Pippin ..	156	8	3	*6	9	7	9
Munroe's Favourite	130	10	0	8	0	9	6
Newtown Pippin ..	17	8	0	7	6	7	10
Purity	24	8	6	8	6	8	6
Reinette de Canada	80	7	6	*5	6	6	6
Ribston Pippin ..	13	7	6	7	6	7	6
Rome Beauty ..	89	9	9	7	6	8	8
Rymer	11	10	0	7	6	8	10
Scarlet Nonpareil ..	42	9	0	9	0	9	0
Stone Pippin ..	198	8	9	7	6	7	10
Sturmer Pippin ..	66	8	0	7	0	7	6
Wellington Pippin	59	8	0	7	9	7	10
Various (wet) ..	2	4	6	4	6	4	6
PEARS.							
Winter Nelis ..	19	18	0	14	0	15	8

Per *Somerset* (London), sailed 20th March.

(Fruit excellent. Temperature, 34 to 38 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Jonathan ..	135	11	6	8	3	10	6
London Pippin ..	102	9	6	9	0	9	1
Reinette de Canada	221	8	0	7	9	7	10

Per *Orontes* (London), sailed 23rd March.

(Fruit generally good, few slightly pitted. Temperature, 38 to 40 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adams' Pearmain	11	12	0	12	0	12	0
Ben Davis ..	14	8	9	8	9	8	9
Cleopatra ..	48	10	6	9	0	10	5
Esopus Spitzenberg	70	11	0	10	0	10	9
Hoover	30	9	9	8	0	8	6
Jonathan ..	246	13	6	8	9	11	0
Kentish Fillbasket	2	8	9	8	9	8	9
King of Tomkins' County ..	3	8	3	8	3	8	3
London Pippin ..	314	10	0	8	0	9	3
Munroe's Favourite	237	10	6	8	3	9	9
Newtown Pippin ..	34	11	0	11	0	11	0
Peasgood's Nonsuch	8	11	0	11	0	11	0
Prince Alfred ..	4	8	0	8	0	8	0
Prince Bismarck ..	26	10	0	8	0	8	9
Reinette de Canada	158	11	0	8	3	9	3
Ribston Pippin ..	9	9	0	9	0	9	0
Rome Beauty ..	159	10	6	8	9	9	6
Rymer	167	10	6	8	9	9	4
Simmond's Winter	18	8	0	8	0	8	0
Statesman ..	42	9	0	8	9	8	11
Sturmer Pippin ..	72	10	0	9	9	9	10
Winter Strawberry Pippin ..	10	9	3	9	3	9	3
Yapeen Seedling ..	14	12	6	10	6	11	11
Slack cases ..	11	6	6	6	6	6	6
PEARS.							
Glou Morceau ..	3	8	0	8	0	8	0
Josephine ..	22	28	6	16	6	25	10
Keiffers's Hybrid ..	5	25	0	11	6	22	3
L'Inconnue ..	36	16	0	14	6	15	5
Napoleon ..	20	16	6	12	6	13	11
Vicar of Winkfield	27	18	0	14	3	16	4
Winter Nelis ..	75	28	0	17	0	21	10

* Stained.

Variety of Fruit.	No. of Cases.	Prices Realized. Highest.		Lowest.		Average.	
		s.	d.	s.	d.	s.	d.
Per *Hector* (London), sailed 10th April.							
(Fruit excellent. Temperature, 40 degrees.)							
Ben Davis ..	1	8	0	8	0	8	0
Cleopatra	43	11	0	11	0	11	0
Esopus Spitzenberg	2	9	6	9	6	9	6
Exporter ..	103	10	6	9	6	9	11
French Crab ..	25	10	0	10	0	10	0
Jonathan ..	98	12	6	10	0	10	6
London Pippin ..	823	10	6	8	0	9	1
Melon Pippin ..	5	9	9	9	9	9	9
Merritt's Pearmain	26	9	6	8	6	9	0
Munroe's Favourite	508	13	6	9	3	10	9
Newtown Pippin ..	154	13	0	8	9	10	6
Rome Beauty ..	595	12	0	8	6	9	6
Rymer ..	228	9	6	8	6	8	10
Scarlet Nonpareil ..	46	10	6	9	9	10	0
Schroeder ..	9	9	3	9	3	9	3
Statesman ..	39	9	6	9	0	9	2
Stone Pippin ..	281	9	9	8	9	9	5
Sturmer ..	516	9	6	8	0	8	6
Winter Strawberry	29	9	3	8	3	8	6
Wolseley ..	5	8	6	8	6	8	6

Variety of Fruit.	No. of Cases.	Prices Realized. Highest.		Lowest.		Average.	
		s.	d.	s.	d.	s.	d.
Wellington ..	4	8	9	8	9	8	9
Various	18	9	3	9	3	9	3
PEARS (CASES).							
Bergamot Banfel ..	12	12	0	12	0	12	0
Beurré Diel ..	83	13	6	13	6	13	6
Broom Park ..	16	13	0	13	0	13	0
Josephine ..	58	20	0	15	0	17	0
L'Inconnue ..	107	15	0	10	0	11	9
Napoleon ..	5	13	0	13	0	13	0
Uvedale's St. Germain	9	10	6	10	6	10	6
Vicar of Winkfield	61	13	6	9	6	10	9
Victoria	1	11	6	11	6	11	6
Williams' Bon Chretien	8	14	0	14	0	14	0
Winter Nelis ..	82	18	6	9	0	13	5
PEARS (TRAYS).							
Josephine ..	4	5	3	5	3	5	3
L'Inconnue ..	107	4	3	3	0	3	11
Vicar of Winkfield	6	4	9	4	9	4	9
Winter Nelis ..	34	4	0	2	9	3	9

This list does not comprise all the boats which sailed during the season. It is regrettable that details could not be obtained for all ; notably some which landed their fruit in an unsatisfactory condition. As the furnishing of temperature records during transit is not included in the companies' carrying contract, this information can be given or withheld as each company thinks fit.

The most noticeable feature of the list is the high prices obtained for pears. This is a fruit which doubtless will be largely availed of for export purposes in the future. So much impressed, in fact, are some of our most successful exporters with the future prospects of pear export, that they state their intention of making the cultivation of this fruit a speciality.

It will be seen that most of our exporters still adhere to the error of shipping a wide variety of apples. A glance at the list will show the fallacy of this, as it will be seen that a few of the well-tried and better known varieties still more than hold their own in the matter of high prices.

The question of direct shipments to other markets besides London and Liverpool has not yet received the attention which it deserves. Notice was taken of this matter in last year's report, and the belief was expressed that it would pay in many instances to consign fruit direct to other distributing centres than the ones mentioned. The experience of those who have done so this season seems to bear this out, as one exporter who consigned most of his fruit to Hull, averaged good prices throughout. The Leongatha Labour Colony, as was the case last season, when they shipped direct to Glasgow instead of permitting the fruit to be sold in Liverpool, again reaped a substantial profit, the prices obtained being better than they could have obtained on the London markets. Both Hull and Glasgow are large distributing centres, the first named in particular being situated within a very short distance of an immense population inhabiting York-

shire, Lancashire, and the northern counties of England, totalling in all about 10,000,000 inhabitants. It is, besides, conveniently situated for trade with Scandinavia, Russia, Denmark and other North European countries. An estimate of its capabilities as a fruit importing centre may be obtained from the fact that during the summer months only of 1905, 20,000 tons of soft fruits and 80,000 tons of hard fruits were distributed through the North of England from this port. Hull, however, is only one of many other distributing centres awaiting our exploitation.

SHERRY: ITS MAKING AND REARING.

F. de Castella, Government Viticulturist.

(*Continued from page* 583).

THE "SOLERA" SYSTEM.

We have already seen in connexion with the making of Sherry, several notable departures from ordinary wine-making methods but it is in its rearing—in the curious method by which the young wine is transformed into the finished commercial article—that even greater differences are to be found. This method must now be described.

Clarets, Hocks and most other wines, though they may differ in the treatment they receive in the early stages of crushing and fermentation, are, after racking from their lees, allowed to mature spontaneously, the treatment they receive being limited to ordinary cellar care, filling up, occasional rackings, &c. With Sherry it is entirely different, for this wine is truly reared according to a methodical process which may be termed the *solera* system—a method peculiar to Jerez and the neighbouring districts of San Lucar and Montilla.

Solera is the name given in Spain to a series of butts of Sherry in process of maturation, so conducted as to provide for progressive fractional blending, thus insuring the continued production of a wine of even type in spite of differences which may occur between the produce of successive vintages. In other old world wine districts, wines of different vintages are, as a rule, matured before being blended (if they are blended at all). Wines reared as at Jerez, on the other hand, cease to belong to any particular vintage once they enter a solera.

A solera consists of a series of stages, each of which comprises a number of butts of about 115 gallons capacity. The finished wine is obtained from the final stage, from which not more than one quarter of the contents of each butt is withdrawn at a time. This deficiency is made good from the stage immediately preceding, and so on right through the series, down to the youngest stages, withdrawals from which are replaced with young wine. The wine is thus slowly moved forward through the series, several years elapsing before it reaches the final stage from which it is withdrawn in its finished state, after having been largely blended during the process with the older wines with which it became mixed in the process.

This will be better understood on reference to the diagram representing a simple form of solera—one consisting of 50 butts divided into five stages, each of which is of 10 butts. For the sake of clearness, each stage here constitutes a row of casks, marked respectively with a Roman

numeral. We will suppose that this solera has been in working order for a good many years. Withdrawals of finished wine are made from stage I., whilst additions of young wine are made to stage V.* When it is desired to withdraw the finished wine, this is syphoned out of each butt of the final stage (No. I.), care being taken to disturb neither surface film nor lees. The quantity taken is limited to one quarter of the contents of each butt at any one time. The usual capacity of each butt is about 115 gallons, but as they are always ullaged they would contain, on an average, about 100 gallons of wine. Twenty-five gallons having been withdrawn from each butt of stage I., the void is made good from stage II., an equal quantity of wine (25 gallons) being withdrawn from each butt for the purpose. Stage II. is replenished in like manner from stage III., this in turn receives its quota from stage IV., which is replenished from stage V., the youngest in this particular solera. Stage V. is replenished, either with young wine or with wine of one or more years old which has been kept as an *añada*. Two withdrawals are made from the final stage during the year, at each of which the wine is moved forward throughout the whole system.

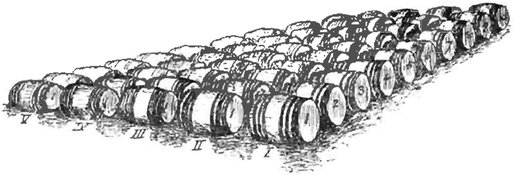


DIAGRAM TO ILLUSTRATE A SOLERA.

Without going into elaborate calculations it is easy to understand what an extremely complex blend the wine withdrawn from stage I. must necessarily be. No portion of the final blend could consist of wine of less than 5½ years' old, whilst the average age would be still greater for it would contain portions of every wine which had ever gone into the solera since its first establishment.

The efficiency of such a system in order to secure the production of an even type of wine, year in and year out, is obvious. The system is very widely applied in the Jerez bodegas. All wines except those few which are kept as añadas and some other exceptional ones, are reared in soleras; nor is the system confined to wine, for brandy (Cognac Jerezano, as it is termed) and vinegar are treated on exactly similar lines.

Our illustration has been designed in order to help to explain the system, for which reason the butts have been placed in methodical order. In reality, the different stages may be distributed in any manner which may suit the convenience of the cellar manager and not arranged in any definite order as has been necessary in a explanatory diagram. Each butt bears such marks and numbers as may best facilitate its identification and that of the stage and solera to which it belongs.

It is not alone in order to secure uniformity, however, that this complex method has been evolved. Its greatest advantage, and the probable reason for its first adoption, is that it renders possible the utilization of

* When this solera was first established each stage represented a particular vintage, but with continual blending these have long since lost their primitive significance.

the flor film, indispensable for the evolution of *fino* wines, without the risk of acetification which would no doubt occur if every cask had to develop separately. The peculiar nature of the flor organism and its relationship to the ferment of vinegar will be referred to in detail presently. It will suffice here to say that once the wine is covered with a film, it is, so long as this remains healthy and vigorous, protected from becoming pricked. Though high class sherries are almost exclusively solera wines, it is only in fino soleras that the flor film is present on the surface of the wine.

Olorosos and older wines which have become too strong for the growth of flor, such as amontillados, still continue to develop in soleras, though they are subjected to somewhat different treatment.

It thus follows that there are great differences between the different soleras in a given bodega in many fundamental respects. The case illustrated above, with five stages of ten casks each, is a very simple one chosen for purposes of illustration. Some soleras consist of as many as thirteen stages and even more. The enhanced price at which such a wine must be sold in order to leave any profit is obvious. Even in the case of our five stage solera, the amount of stock necessary for its proper working is considerable. Admitting two removals per annum of 25 gallons from each butt of stage 1, this would give us only 500 gallons per annum from a stock of 5,000 gallons. In the case of soleras with more than five stages, the stock which must be kept is correspondingly increased. The loss by evaporation, interest, &c., is considerable, hence it is that solera wines can never be reared at a cheap price.

Management of Soleras.

From what I was able to see during my brief visit the following points seem to be of greatest importance—

Care is taken in making withdrawals and additions, to disturb neither lees nor film. For the former purpose, a copper syphon, of ordinary type, is used which draws the wine from about the centre of the butt. For replenishing (*Rosear* in Spanish) a special appliance, is employed figured in our illustration This consists of a slightly curved copper tube of sufficient length to penetrate deeply into the butt. A flange at the upper extremity enables it to hang freely from the bung-hole. A funnel fits into the upper part. The lower portion is pierced with lateral holes through which additions find their way quietly into the bulk of the wine in the cask without appreciable agitation. A withdrawal from any given butt of an intermediate stage is not fed bodily into the corresponding butt of the next stage but is distributed evenly among all the butts of which it consists, thus insuring complete and automatic blending and complete uniformity in all the butts of any given stage. To refer to our diagram, suppose, for example, 25 gallons have been withdrawn from

APPLIANCE USED TO REPLENISH (ROSEAR) SOLERA BUTTS.

butt 6 of stage III.: instead of this wine being fed into butt 6 of stage II., it is distributed evenly throughout the whole of stage II.—2½ gallons to each butt, and so on with each butt of each stage in succession. All transfers being made with the syphon and bucket, this seemingly complicated distribution is made easy—far more so than it could be were cellar pumps in general use.

It may happen, from some reason or another, that an individual butt of a solera should become faulty. Its contents, in their forward march, would contaminate the next stage of the series. Frequent tasting is necessary to guard against such a contingency and to insure that all are in good order. Should a faulty cask be discovered,—as occasionally, though rarely happens—it is immediately withdrawn and a clean butt substituted for it which is filled with wine, withdrawn in equal quantity from the other butts of the same stage. The butts of a solera are never quite full; the amount of ullage varies according to the nature of the wine, being greatest in the case of fino soleras which require more air in order that flor may thrive—usually this varies between ⅛ and 1-20 of the total bulk of the cask.

BOTTLING ESTABLISHMENT OF MESSRS. DIEZ HERMANOS.

Sulphur is but little used in Jerez in connexion with the handling of the wine, though empty casks are sulphured in the ordinary way in order to keep them sweet. This is not astonishing, seeing that the presence of sulphurous acid, or any other antiseptic, would hinder the development of flor.

Elasticity of the System.

The simple form of solera represented in our diagram must not be looked upon as a definite type universally adopted. In reality, they vary very considerably in constitution, arrangement and management. The system allows a very great measure of elasticity—the different stages, even of a given solera, do not necessarily consist of the same number of butts.

The system permits of maintaining a very even standard notwithstanding a variable output. Should the demand for the wine of a given solera become more active, the wines of earlier stages are pushed forward more rapidly. When the trade is dull their progress is slower. Sometimes the number of stages may be increased or diminished according as trade is slack or brisk. There is no absolute rule and each cellar manager deals with his soleras according as he thinks best, or as the demands of trade may dictate.

Some soleras consist of only a few stages, say five, such as the one represented in the diagram or even less, others, again, may number as many as thirteen or fourteen. There is no rule or limit. With the rate of progression of the wine, likewise. The more usual way is for two withdrawals a year to be made, each consisting of one-fourth of the contents of each butt of the final stage. The ensuing replenishments cause the annual moving forward of one-half of the contents of every butt throughout the whole series. In some bodegas the progression is made four times a year, one-eighth of the contents of the individual butts going forward at each operation. These are matters of detail to be decided by the manager of the bodega.

It occasionally happens that wine is withdrawn, for sale, from different stages of a solera, the value being determined by the stage from which it was drawn. Such procedure is by no means general, nor is it considered good policy. The best managers adhere to the rule of only withdrawing from the final stage. It thus follows that, in the best bodegas, any given solera is entirely devoted to the production of one, strictly limited type of wine, which is the wine to be found in the final stage of that particular solera. The number of different soleras to be found in any of the larger bodegas is thus very numerous. Some produce very expensive wines; others, cheaper wines, but each solera should turn out one class of wine and one only.

Names of Sherries.

Sherries are thus known by the name of the solera from which they are drawn and in which they have been reared, rather than by that of a vineyard (vintage is quite out of the question) as is usual with other wines. The names given to Sherries are usually arbitrary and sometimes very fanciful. We have seen (p. 516) that Sherries can be divided into several main types—Fino, oloroso, amontillado, &c. Each type can in turn, include many soleras. To take the wines of two of the leading firms, we find such names as Tio Pepe (Uncle Joe), Amorosa, Tula (name of a vineyard). Matusalem (an allusion to its great age), A.B., N.T., &c., figuring in the usual trade reports.

Practically the totality of the best wines are solera wines—cheaper sorts are blends of these with wines of neighbouring localities.

Solera or Criadera.

Hitherto, for simplicity's sake, we have confined ourselves to the former of the above terms. The second, which is of constant occurrence in Jerez, must now be explained. The two expressions are, at least at the present day, to some extent synonymous, although not entirely so. In former times, the term *Criadera* was applied to the earlier stages of the series in which the wine is reared. It is, in reality, the more logical term of the two, meaning, as it does, a breeding or rearing place, whereas solera means the last or lowest row of the series—the final stage which

is resting on the ground (literally foundation or base). Strictly speaking, the term *Solera* should be limited to the final stage from which the finished wine is withdrawn. The others are all Criaderas; yet the term solera has gradually come to be applied to the whole system of sherry rearing.

In some bodegas the whole series is divided into two groups, the younger stages being known as Criaderas and the older as Soleras. A definite line of demarcation can scarcely be drawn between the two and in order to avoid confusion it will be best to confine ourselves the the use of the word solera.

DIFFERENT TYPES OF SOLERAS.

We have seen that all Sherries can be divided into several main groups, each of which may embrace a considerable number of different wines. In a general way, certain peculiarities, both as regards character and special methods of treatment, belong to each group in addition to the broad lines of solera management already described. We can thus distinguish between the following:—

Fino Soleras.—These constitute the largest group, the one which embraces the wines most in demand at the present day. They are clearly distinguished from other groups by the presence of the flor film. This, with its power of developing the curious, characteristic etheral flavour, could scarcely be methodically worked by any other than the solera method. Were it necessary for each cask to develop its own film, uniformity would be most difficult to obtain, and the risk of casks turning out badly very considerably increased, for it is before the film has become properly established that there is danger of acetification. Protected, as the wine afterwards is, by a complete film this danger disappears. Once thoroughly formed, this remains almost unchanged, being sufficiently elastic to adapt itself to the changes of level caused by withdrawals and additions or the slight disturbance caused by the drawing of a sample.

The amount of ullage in the casks is rather less than with the previous one-tenth of the contents of the cask. The entry of air is fairly free. In some bodegas, the bung-hole is closed with a small china cap placed over it; in others, it is loosely closed with a large cork sufficient to prevent the entry of insects.

A curious feature in connexion with this group is that the wine in the youngest stages sometimes appears to be rather out of condition, especially after addition of younger wine. The trouble is only transitory and as it moves forward into more advanced stages it regains its brightness and develops the character peculiar to the type.

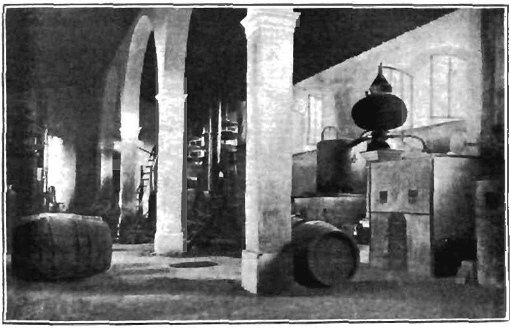
Oloroso Soleras.—These differ mainly from finos by the absence of flor. The slight, dark coloured film usually present on their surface is probably composed of substances thrown out of solution by exposure to air—it is not organized in any way. The alcoholic strength of these wines is usually over 27 per cent. proof, a point above which the growth of flor is not possible.

The amount of ullage varies somewhat. On an average, it is about group. The absence of flor renders a lesser amount of air in each cask sufficient.

In the case of these wines, the solera system appears to be applied rather on account of the automatic blending and uniformity of product than for any other reason.

Amontillado Soleras.—We have already seen that an Amontillado wine is one which was originally a fino but which has entered on the second period of its development. This second period is, however, passed in a different solera to the first. Soleras generally are designed, and so conducted, *that the wine in the butts of the final stage is all that that particular solera is expected to produce.* Amontillado soleras are therefore recruited from fino ones, and only from the best of these, which alone are able to stand the long maturation necessary for the evolution of the amontillado character. Amontillados are thus, necessarily, high priced wines —more especially as in their case the number of stages is usually considerable, for their evolution is slow.

Amontillado soleras are devoid of flor. By the time the wine is fit to go into them it has increased in strength to such an extent that its growth is no longer possible.



BRANDY DISTILLERY OF MESSRS. GONZALEZ BYASS AND CO.

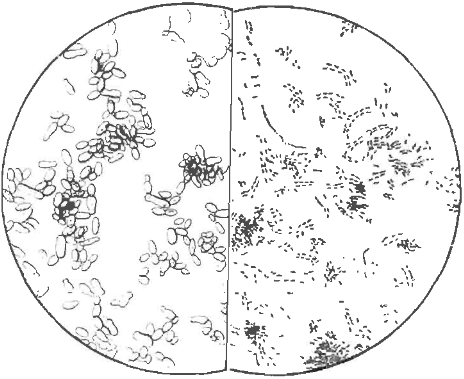
Composite Soleras.—Many of the large Jerez houses conduct soleras destined to the turning out of a complex wine (as distinguished from the usual blend of finished wines made just before shipment); for example, the wine sold under the name of Noé by Gonzalez Byass and Co.—a very expensive wine.

Of course, in this category, almost any combination is possible; it depends entirely upon the judgment of the cellar manager. These composite soleras might really be termed "soleras of soleras" as the wine going into the youngest stage is usually a blend of varying quantities of final stage wines from other different soleras. It is for these that the exceedingly old añadas, bitter and brown, but of great character and flavouring power, come in most useful. A small proportion of one of such wines usually forms part of the wine used to *rosear* the first stage. Sometimes a little very old *Vino de Color* and also some sweet *Pedro Ximenez* also find their way into the blend. These composite soleras are usually of few stages—three or four as a rule. They are devoid of flor and only serve to automatically blend and secure thorough amalgamation and even type in a blend of wines already matured by long sojourn in other soleras.

The Fungus Film.

The fact that flor could be allowed to grow on the surface of wine on ullage, without risk of acetification, came to me as a contradiction of my previous wine-making experience. How was it, for example, that the presence of flor or flowers on the surface of the wine, which I had been always taught to look upon as a faulty condition, fraught with grave danger, was one of the leading features of sherry rearing—of fino wines at least. Since my return to Australia the same question has been put to me repeatedly. How is it that the wine does not become pricked? A complete answer is given by a study of the life history of the organism of the ordinary flowers of wine, *Mycoderma vini*.*

On my return to Montpellier after having visited Spain, I had a most interesting conversation with Professor Bouffard, Director of the Œnological Laboratory, at the Montpellier College, to whom I asked this very question. For reply he referred me to the chapter of Pasteur's *Studies on Wine* which deals with acetification.



MYCODERMA VINI AND MYCODERMA ACETI (AFTER PASTEUR).

In the neighbourhood of Arbois, in the French Jura district, it has for generations been customary not to fill up certain wines, but to rely upon the protection afforded by the layer of flowers, or *Mycoderma vini*, which freely grows on their ullaged surface. Pasteur proved for the first time, that so long as this organism exists in a state of purity and finds conditions suitable for its active growth, acetification does not take place; *Mycoderma vini* absorbs oxygen so energetically that in the words of Pasteur—

"This liquid (wine), even freely exposed in contact with air cannot dissolve the slightest trace of oxygen if it be covered with a film of *Mycoderma vini*."

* The exact nature of the flor organism is not clear. Whether none other than common *Mycoderma vini*, which it resembles exactly when seen under the microscope (see illustration) or an allied organism has not yet been decided.

10

The relative properties of *Mycoderma aceti* (the vinegar ferment) and *M. vini* (flowers of wine) are dealt with at length by Pasteur whose description on page 103, *Études sur le vinaigre*, throws much light on the subject. Should *Mycoderma vini* develop exclusively no harm is done to the resulting wine—its presence prevents the development of *Mycoderma aceti*, and causes the wine to remain sound. The plate (adapted from Pasteur's work on vinegar) will enable an idea to be formed of the appearances of these two organisms so widely different in the products they give rise to, as well as in their appearance under the microscope.

Strange to say, *Mycoderma vini* has, since Pasteur's remarkable studies, received but little attention at the hands of authorities on wine-making. In French viticultural literature it figures as a disease organism, being incapable of doing much harm, it is usually dismissed with brief attention. Writers upon the subject consider it powerless to do harm. It is held to turn the alcohol of the wine into water and carbonic acid and the only effect it is said to have on the wine is to give it a flat taste (*goût d'event*). Such action is in marked contrast with the action of the flor film present in Jerez and the extraordinary transformation it brings about in flavour and character of the wine. Such contrast prompts one to ask if the flor film of Jerez is really the same organism as the ordinary flowers of wine, or if it be an entirely different organism. At the present moment, this question cannot be properly decided.

Pasteur and other writers admit that there are several different varieties of *Mycoderma vini*. It is highly probable, therefore, in view of the very special flavour developed by the organism in the bodegas of Jerez, that it is a special variety which constitutes the film on the fino soleras—a special variety, however, of the ordinary *Mycoderma vini* which is influenced in the same way by the same variation in the conditions under which it grows as the common form studied by Pasteur.

Pasteur's memoir on Acetic Fermentation throws so much light on the relative action of the two organisms and on their behaviour, when both are present at the same time, that those interested in this little studied question are referred to it, especially to paragraph IX. on *Mycoderma aceti* considered as a parasite on *Mycoderma vini*. After dealing with the results of the simultaneous presence of the two organisms in the same liquid, he points out how, in certain cases, the *M. vini* can decompose the acetic acid produced by *M. aceti* so that the percentage of acid in the liquid may not increase. He concludes in the following terms:—

"As soon as, by any circumstance whatever, *Mycoderma vini*, so frequently (present) on the surface of fermented liquids when they are exposed to air, happens to lose its vitality, if, for example, food suitable to it is missing, *mycoderma aceti* invades it after the manner of a parasite living on it and alongside of it, assimilating its substances, burning a portion of them by reason of the same faculty which makes of this *Mycoderma* an agent of partial or total combustion of alcohol and of acetic acid."*

This throws light on facts that had been observed since earliest antiquity.

He quotes Pliny as proof that even ancient writers had given this interesting question attention. Pliny says:—

"White flowers of wine are a good omen, red a bad, unless that be the colour of the wine."

* Pasteur remarks, in a footnote (p. 23): "The physical aspect of the flowers (film) changes with its purity, and one can, as it were, connect this aspect with its nature and its action on the wine."

Paccotet, in his recent work on wine-making,* resumes the life history of *Mycoderma* very concisely as follows:—

"*Mycoderma vini* . . . . forms on the surface of the liquid white films which thicken, become wrinkled, and are submerged with difficulty. . . . . . Several varieties exist. . . . . This plant burns up alcohol, which it transforms into water and carbonic acid without intermediate product. In the cask, the carbonic acid thus produced fills the vacuum in the cask and protects the wine against the development of the *Mycoderma*, so that flowers of wine are not to be feared in the same way as *Mycoderma aceti*, of which nothing hinders the development since it does not produce carbonic acid to interfere with the entry of the air it needs."

Lengthy quotations are not possible. Those interested are referred to the works of Pasteur† on wine, on vinegar, and on beer. And also to Semichon's more recent work on the diseases of wine,‡ a study of which will show that the method of treating fino soleras insures the continued growth of a film of *Mycoderma vini*, the presence of which in a state of purity protects the wine from the development of *Mycoderma aceti* and the acetification which would ensue. Needless to point out, every precaution must be taken to render the wine as suitable as possible for the growth of the former to the exclusion of the latter. One point of importance in this direction appears to be the use of yeso or plaster in the first making of the wine.

It is evident that the question is a complex, though a most interesting one, well worthy of thorough scientific investigation. The results obtained in Jerez in the shape of the fine wines for which the district is famous are the outcome of special methods arrived at empirically during centuries of practice.

(To be concluded.)

SEED TESTS.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University, and Bertha Rees, Government Research Bursar.

Nearly the whole of the agricultural and garden seeds sold in Victoria are imported from abroad, and pass through the Customs mostly in large bulk. The total number of importations per week naturally varies at different times of the year, but, on the whole, averages 10 to 20 per week. According to the recent Commonwealth Quarantine Regulations, such seed must be free from certain injurious weed seeds, and from the seeds of various poisonous and parasitic plants. The total number of plants on the prohibited list is nearly 100, which seems a large number, but which is really exceedingly small when compared with the 200,000 or 300,000 species of plants known to science.

The Customs Regulations include no provision as to the germination value of imported seeds, and since the State has no Pure Seeds Act, it is possible for seed to be imported and sold, which has totally lost the power of germination. This is no fanciful case, but actually occurred recently with an imported sample of Couch grass seed.

With very few exceptions, every civilized country has either a Pure Seeds Act, or possesses seed testing establishments, where farmers, seedsmen, and the public, can have seeds tested either free of cost or at a nominal charge. The natural result is, that the poorest quality seeds will tend to reach those countries which are not protected in this way, and

* Paccotet—*Vinification.*

† Pasteur—*Etudes sur le Vin, Etudes sur la Biere, Mémoire sur la fermentation acetique.*

‡ Semichon—*Traite des Maladies des Vins*, 1905.

since a single importation may represent the major part of a particular kind of seed available for seasonal distribution in Victoria during a particular year, a seedsman may be compelled either to send his customers seed of poor quality, or to cause them to lose a growing period, since to order a fresh supply from Europe may take three or four months.

Some detailed information as to the character and quality of the seed imported into Victoria was obviously highly desirable, and since no seed-testing establishment exists in this State, the services of one of the Government Research Bursars was utilized for this work, which, though hardly pure research, is of considerable economic importance. The samples were representative ones, forwarded by the Customs authorities, and the results seem to show that Victoria is either not receiving the best class of seeds or else the seeds sent deteriorate considerably on ship-board. The latter is quite possible when seeds are stored in a badly ventilated hold along with a mixed cargo. In fact, many seeds are quite as perishable as meat, fruit, or butter, and require equal care in their carriage. The most important points in preserving seeds are that they should be cool and dry and kept under as uniform conditions as possible.

In some cases, as, for instance, with pear seed, the exporter often packs the seeds in charcoal, which keeps them dry and absorbs any injurious gases from the hold of the ship, which might injure the seed. The charcoal is subsequently removed on landing by sieving and rubbing the seeds, but seeds that have been placed in charcoal can be recognised by their blackening the finger when it is passed through them. In many cases, such seed will give a better germination than imported ones, which have not been packed in this way.

Very little is known as to the best ways of packing and transporting different seeds, but probably, investigation would reveal various ways of reducing the fall in germination value of sensitive seeds during a long sea voyage. In addition, it would probably be found that seed from certain countries stands the sea-voyage better than when derived from other countries. This appears, for example, to be the case with the seeds of carrots, parsnips, and some grasses. Naturally, exact data of this kind would be of great value to the seedsman in determining the best source from which to derive particular seeds.

It is to be regretted that so little pedigree seed is produced on a commercial scale in Victoria, that is to say, seed harvested from pure strains kept true to type. There seems ample room for a considerable local expansion of the seed industry in this direction, and there is no cultivated plant whose seed could not be raised as well in Victoria as in Europe. So long as we are dependent mainly upon imported seed, the difficulty of satisfactorily fulfilling all the needs of the Australian seed market will be considerable, and the average germination value will not be as high as it would be in the case of locally grown seed.

Unfortunately, in certain cases, farmers have attempted to place upon the market the screenings from grain crops as agricultural seed, simply because such screenings contained a certain proportion of clover and other fodder plants or of *Melilotus* and other plants useful for green manuring. In one case, a sample of Rye grass submitted for sale contained 32 per cent. of *Melilotus parviflora*, which, though useful for green manuring, is hardly a good pasture plant, and 11 per cent. of wild oats. In another case, a sample of *Melilotus* contained no less than 42 per cent. of weed seeds, including 13 different kinds. In yet another sample, supposed to be sold for green manuring, and consisting mainly of clovers, no less than five proclaimed plants were present, including dodder.

Such cases are apt to give locally grown seed a bad name, especially when the wrong seed is sold under a particular name. Recently, the seed of a troublesome weed, South African Wood Sorrel, was sold and planted as Clover. Similarly, two years ago, large amounts of the seed of a grass, *Ehrharta longiflora*, were sold as *Anthistiria* (*Themeda*) *avenacea*, the two grasses having quite different properties, the latter being drought resistant, and much more valuable. Hence, it is not surprising to find weeds suddenly appearing in new districts, which were previously free from them, or to find that approximately one new plant every two months becomes naturalized in this State, and that most of these naturalized alien plants are injurious weeds. As long ago as 1835 Darwin noted in *A Naturalist's Voyage Round the World*, p. 513, that "the common Dock is also widely disseminated (in New Zealand), and will, I fear, for ever remain a proof of the rascality of an Englishman who sold the seeds for those of the Tobacco plant."

TABLE OF SEED TESTS.

NAME.		Source of Origin.	Total percentage of Weed Seeds.	Percentage of Germination.	Proper percentage of Germination.
Botanical	Common.				
Andropogon halepensis, Brot.	Johnston grass ..	America ..	·5	23	Over 90
Avena sativa, L.	Black oats ..	?	*Nil*	35	Over 90
Beta vulgaris, L. (1908 test)	Mangel wurzel ..	Germany ..	*Nil*	6*	Over 90*
Beta vulgaris, L. (1908 test)	Mangel wurzel .	Germany ..	*Nil*	22*	Over 90*
Beta vulgaris, L.	Beet, "Long red"	Germany	*Nil*	9*	Over 90*
Beta vulgaris, L.	Mangel wurzel ..	Germany ..	*Nil*	84*	Over 90*
Brassica oleracea, L. ..	Cabbage, "Success"	America ..	*Nil*	96	Over 90
Brassica rapa, L.	Rape	Germany ..	*Nil*	85	Over 90
Cannabis sativa, L. ..	Hemp ..	Germany	*Nil*	7	Over 90
Cucumis melo, L.	Musk melon	America ..	*Nil*	100	Over 95
Cuminum cyminum, L. ..	Cumin	France ..	*Nil*	17	Over 60
Cynodon dactylon, Pers. ..	Couch grass ..	Europe	*Nil*	*Nil*	Over 75
Cynosurus cristatus, L. ..	Crested dog's tail	England ..	*Nil*	41	Over 70
Dactylis glomerata, L. ..	Cocksfoot ..	N. Zealand	·35	51	Over 80
Linum usitatissimum, L. ..	Linseed	India ..	14	91	—
Lolium perenne, L. ..	Rye grass ..	N. Zealand	*Nil*	90	Over 90
Pastinaca sativa, L. ..	Parsnip, "Hollow Crown"	America ..	*Nil*	36†	Over 50
Phalaris canariensis, L. ..	Canary seed ..	Turkey ..	2	83	Over 90
Rheum hybridum, Murr. ..	Rhubarb	Victoria ..	*Nil*	83	Over 80
Sesamum indicum, L. ..	Sesame	Japan ..	·01	32	Over 90
Solanum lycopersicum, L. ..	Tomato, "Atlantic Prize"	?	*Nil*	82	Over 90
Trifolium Alexandrinum, L.	Egyptian clover ..	?	·8	92	Over 90
Vicia sativa, L.	Scotch horse bean	?	*Nil*	100	Over 95
Vicia sativa, L.	Horse bean ..	N. Zealand	*Nil*	100	Over 95
Vigna sinensis, Endl. ..	Clay cow peas ..	America ..	*Nil*	95	Over 95
Zea mais, L.	Pop corn ..	America ..	*Nil*	62	Over 90

* Percentage of fruits producing seedlings. † 14 per cent. hard seeds.

Andropogon halepensis, Brot. (Johnston Grass).—Good sample with few weed seeds (chiefly *Chenopodium album*). Seeds somewhat unevenly ripened and gave very poor germination results.

Avena sativa, L. (Black Oats).—Free of weed seeds, but low percentage germination.

Beta vulgaris, L. (Beet).—100 fruits contained 213 seeds of which 19 germinated; 5 per cent. fruits were barren; 16 per cent. contained 1 seed, 43 per cent., 2 seeds; 33 per cent., 3 seeds; and 3 per cent., 4 seeds. Of these, 3 fruits produced 1 seedling, 4 fruits produced 2 seedlings, and 2 fruits 4 seedlings. The best seed is that in which each fruit produces one seedling, extra ones are no use since there is no room for them to develop. The germination value is therefore given as the number of fruits producing seedlings and not the number of seeds germinating.

Beta vulgaris (Mangel Wurzel).—100 fruits contained 220 seeds of which 140 germinated; 8 per cent. fruits contained 1 seed; 72 per cent., 2 seeds; 12 per cent., 3 seeds; and 8 per cent., 4 seeds. Of these, 17 fruits produced 1 seedling; 17 fruits, 2 seedlings; 5 fruits, 3 seedlings; and 2 fruits, 4 seedlings.

Brassica oleracea (Cabbage).—Sample pure, but seeds very unevenly ripened and varying in size from 1 to over 2 m.m.

Brassica rapa (Rape).—Sample pure, but seeds varied from 1.5 to 2.5 m.m. in diameter.

Cannabis sativa (Hemp).—Seed clean and free from weed seeds, but gave low germination result.

Cucumis Melo (Musk Melon).—Excellent sample.

Cuminum Cyminum (Cumin).—A very low germination value.

Cynodon Dactylon.—The result speaks for itself. This seed was actually bought and planted by at least one private individual, but, of course, without any result.

Cynosurus cristatus (Crested Dog's Tail).—Germinated very irregularly; 22 per cent. came up quickly; the remainder required from 3–5 weeks in all. Many of these would fail in the soil.

Dactylis glomerata (Cocksfoot).—Containing a few weed seeds, chiefly a Composite (*Crepis fœtida*, Stinking Crepis). Very slow in germinating, and were kept in germinating chamber over 5 weeks.

Linum usitatissimum (Linseed).—Contained a number of weed seeds, including Convolvulus (Bindweed), Melilotus, Charlock and other Crucifers.

Lolium perenne (Rye grass).—Being from New Zealand, this seed had only been subjected to a short sea journey.

Pastinaca sativa (Parsnip).—Clean sample of seed, but containing about 16 per cent. unfertile seeds. Kept in germination chamber for seven weeks, when 13 seeds still remained ungerminated and undecayed. These would be practically valueless as seed, owing to the excessive delay in their germination, even if ultimately they formed seedlings.

Phalaris canariensis (Canary seed).—Contained a number of weed seeds, including Melilotus, two species of Polygonum, Charlock (*Brassica Sinapistrum*) Johnston Grass (*Andropogon halepensis*), Ragweed (*Ambrosia artemisiæfolia*) and Purple Cockle (*Lychnis Githago*).

Rheum (Rhubarb).—Above the germination value. The only certain local sample tested on the list.

Sesamum indicum (Sesame).—Possibly intended for grain, not for seed.

Solanum Lycopersicum (Tomato).—Possibly a locally grown sample.

Trifolium Alexandrinum (Egyptian Clover).—Contained a small number of weed seeds, chiefly two forms of Composite and a species of Dock.

Vigna sinensis (Clay Cow Peas).—14 per cent. were hard seeds and required treatment with strong sulphuric acid for one hour to make them swell. Not a very good sample, as seeds unevenly ripened and 5 per cent. damaged.

Zea Mais (Pop Corn).—13 per cent. bad. No weed seeds present, but the grains were nibbled by mice and pierced by weevils.

From the foregoing list it can be seen that the largest number of weeds were found in the seeds from India and Turkey. In only seven cases did the germination value exceed or come up to the limit usually set for good seed. In five cases, the germination value was one-third of what it should be, or even less. In a total of seventeen cases, the

germination value was below the proper percentage. In one case, the germination value was nil; in another, 6; in a third, 7; and in a fourth, 9 per cent. These cases, of course, would mean an absolute failure of the crop, and a loss not merely of the value of the seed but also of the money spent in preparing the ground, as well as the value of the land during its enforced idleness. In addition, it must be remembered that properly made tests in a germinator give higher values for seeds than can be obtained in fields or gardens, since the seeds are kept under the best possible conditions, and are shielded from all external injurious agencies.

WOOD SORREL SOLD FOR CLOVER.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

Whilst on a visit to Hamilton recently, Mr. Seymour, Potato Expert, was interviewed by a local farmer regarding a crop that was growing on a small field on his property. The field in question was sown with seed bought as Clover seed but at the time of inspection it was covered with what was evidently a weed. Mr. Seymour forwarded a flowering specimen to me and I have identified it as *Oxalis cernua*, Thunb., South African Wood Sorrel. This plant, when in leaf, is sometimes mistaken for clover. An English species of the same genus, *Oxalis Acetosella*, is supposed to be the original Irish Shamrock, now usually represented by a clover, *Trifolium repens*.

The Wood Sorrel is a naturalized alien which prefers slightly sour soil and though it likes moisture, tides over drought by the aid of its underground parts. These produce bulbils freely, and since the seed is also abundant the plant spreads rapidly. Drainage and liming, followed by manuring, and coupled with a scarifying of the surface, and the encouragement of the larger pasture plants, are usually sufficient to practically suppress it on pasture land infested by it. On agricultural land, clean cultivation and a season or two of root crops, potatoes or leafy fodder crops are advisable. A year's fallowing, coupled with frequent stirring of the soil in the hot weather or as often as any fresh growth appears, is useful, provided the soil is not too light, in which case it may waste. The plant readily spreads in again from roadsides, waste places and the borders of fields if these are left foul. Although the leaves are nutritious and have been used as a vegetable, they are too acid to form good fodder and are usually untouched by stock.

The Wood Sorrel resembles Clover in the shape of its three leaflets placed at the end of a long stalk, but the leaves are more fleshy and have a distinct acid taste. The flowers are large, each on a distinct stalk in a loose cluster at the end of the upright flowering stem. In this species they are yellow, but in other Wood Sorrels they are often pink or white. The flowers of Clover are like very small Pea flowers and are clustered in dense heads, so that a child can distinguish between a true clover and a wood sorrel.

A somewhat similar error has caused many people to plant a useless fodder plant in place of a useful one, in this case the error arising from confusion in the popular names. In many cases Tagasaste (*Cytisus proliferus*, L. var. *albus*), which is often erroneously called the Tree Lucerne, has been sold and planted in place of the true Tree Lucerne, *Medicago arborea*.

Tagasaste is of some use as a rapidly growing shelter hedge, especially on dry sandy soils, and bears white scented flowers. Like other species of *Cytisus*, it is probably poisonous when continually eaten, and it can often be seen how cattle and horses deliberately avoid it when grazing.

The Tree Lucerne (*Medicago arborea*), on the other hand, while it can be used for hedges, is also a useful fodder plant. Cattle and horses eat it readily, and it promotes the flow of milk, while being deep rooted it is as resistant to drought as the ordinary lucerne, although being taller it is more exposed. A clump of Tree Lucerne would be a useful stand-by on any farm where stock were kept and but little or no fodder stored, but a clump of Tagasaste, the false Tree Lucerne, would be quite useless or even dangerous to use for this purpose. Nevertheless, the confusion between the two names is so great that the purchaser who asked for Tree Lucerne would as likely as not receive Tagasaste, while the seedsman who always supplied *Medicago arborea* when asked for Tree Lucerne would often give his customers a fodder plant when they merely desired a shelter hedge. This is one instance of the importance of precision in regard to both the popular and the scientific names of plants.

SPRING MANAGEMENT OF BEES.

R. Beuhne, President Victorian Apiarists' Association.

(*Continued from page* 574.)

Whether it is preferable to allow natural swarming to take place, or to practise what is generaly called artificial swarming, depends upon the number of colonies of bees kept in one apiary and the ability of the bee-keeper to keep them under supervision during the swarming hours in fine weather. In an apiary of 100 colonies and upwards, located at the residence of the owner, where someone is likely to be always about during the swarming season, it is perhaps easiest to allow natural swarming, if there should be any indications of it after the weaker colonies have been levelled up with combs of brood from the stronger ones.

Where queens are clipped, someone must be in attendance when a swarm issues to pick up the queen and cage her in the new hive, to which the swarm will return if it is placed on the stand occupied by the parent stock. The hive of the latter is removed to a new stand, if an increase is desired; if not, it is only temporarily shifted until most of the old bees that remained on the combs have returned to the old stand and joined the swarm. In that case, the combs of brood with adhering young bees may be used for strengthening any weak colonies still remaining, by giving them one comb of brood and bees each; any combs without brood and the remaining bees may be returned to the old stand and joined to the swarm.

Any queen-cells found on the brood combs distributed should be removed. If the swarm issued after a spell of bad weather, it is advisable to look for hatched cells and virgin queens before giving the brood to other colonies, and the combs and bees back to the swarm. One comb containing young larvæ and eggs should be given to the swarm along with the frames of full sheets of foundation. This comb of young brood will prevent the troublesome turning out of newly-hived swarms which occurs some seasons. It should, however, be removed again as soon as there is young brood in the other combs, otherwise queen-cells may be raised and a swarm issue before long, should the queen be old or failing. Swarms will often start queen-cells on the new combs, even when the comb of

larvæ given to hold the swarm is removed; but, unless the queen is failing, the cells are torn down again.

A swarm should be examined in a week or ten days, and if there are queen-cells they should be broken out. If, on further examining the combs a week or so later, queen-cells have again been started, the bee-keeper should take it as a hint that the queen will soon give out, and he should replace her with a young one at the earliest opportunity. If the ages of queens are known to the bee-keeper, any three-year-olds which came off with swarms should be superseded with young ones as soon as such are available.

When a watch cannot be kept on the apiary, as in the case of people with whom bee-keeping is a side issue, or at out apiaries which are visited only at intervals, artificial swarming will be found more convenient. When queen-cells are first found in colonies, they should be broken out once, unless the colony is very strong, when it may be operated on immediately. Look over all the brood combs and remove half of them, selecting those containing the most sealed brood. If artificial swarming without increase is the object, the bees may be shaken off these combs back into the hive and one of the combs given to each of the backward stocks, the places of the combs removed being filled with empty drawn combs or full sheets of foundation. In about a week or ten days these combs will contain young larvæ and eggs, while the brood in the original combs will now be mostly sealed and may be removed. It can be used up in the same way as the first combs taken out and replaced with empty combs or partly filled combs (without brood) from stocks to which brood was given. The whole of the brood will now have been removed. There will be no risk of the swarm turning out or running down too much, as would be the case if all the brood had been taken away in one operation, because the bees were never without brood; and for only half the time were they without hatching brood.

If increase with artificial swarming is desired, the bees are not shaken off the combs of brood removed but put into a single-story hive on a new stand, taking care to leave the queen behind. The brood of the new stock thus made should be flanked on each side with a comb of honey and pollen. After most of the old bees have returned to the former stand, one or two combs of brood should be removed if not sufficient bees are left to properly attend to and cover the brood during a cold change. No bees should be taken away with the brood and the brood left to the new stock should contain as much as possible the brood nearest hatching. If a spare queen is not available to give this stock, a queen-cell from a good stock should be inserted.

When only a temporary increase is wanted for the purpose of getting young queens to supersede old or failing ones, these new stocks may be placed on the top of single-storey weak colonies or two new ones, one on top of the other. In each case there should be a solid division between the lower and upper boxes and a separate entrance for the top one, at right angles to the lower entrance, to avoid returning young queens entering the wrong box. When the necessary number of queens has been obtained, two such lots may be united at dusk after first removing the queen from one of them. During the day uniting is done by lifting off the top stock, removing the division board, and placing the best of the brood into the lower box, alternating the combs from the two. Smoke the bees during the operation and place the upper box with the remaining combs on the top. Should both queens be laying there is no risk whatever of any bees being killed through fighting, which happens when the bees of a laying queen and of a virgin are united.

OATS FOR FATTENING SHEEP AND LAMBS.

H. W. Ham, Sheep Expert.

The methods of management and the benefits and profits likely to accrue from feeding oats to sheep cannot be stated in a general way, as much depends on the breed, health, degree of condition, and the price paid for the sheep when bought.

Each individual farmer must study for himself the advantages of being near a market, both for buying and selling. A fairly well improved farm and proper appliances are necessary, and, above all, good fences, for the breeds that pay best for this work are the worst on fences.

A farmer needs good judgment and a knowledge of sheep, in order to buy healthy and suitable types for this object. The difficulty, in late years, has been that sheep of the right class are seldom offering. Merinoes are the least suitable for the work, although good profits have been made out of them when bought at a low figure, in times of drought, but they take longest to fatten.

Seasons vary; some years it is possible to buy very cheaply in February and March, whilst in other years sheep are dear right through, and there is very little difference between the price of stores and fats, which will probably be the case during the next few months. When the northern areas are experiencing fair seasons, sheep will fatten there rapidly and cheaply; and if farmers are to compete profitably they must of necessity buy store sheep at the cheapest time, and have them fat for the winter months. In early spring the northern farmers can have fat sheep ready off the natural pasture, especially ewe mutton. Any ewes that miss getting in lamb, or even those whose lambs die, are by then very fat; and if fat sheep are selling at all well, it pays to send them down.

Half a pound of oats per day will keep an average sized sheep going well, providing good water is available. If there is a fair picking of grass as well, they will steadily fatten. The larger the sheep, and the more its disposition is to put what it eats into wool-production, yolk, &c., the more feed and longer time it takes to fatten.

Merinoes as a rule are not suitable for this method of fattening. They are wilder for one thing, and a great many station cull lots are badly shaped and yolky woolled, and never fatten. The skins of good merinoes, especially when fattened on natural pasture, are most valuable, and assist in selling the sheep; but when fattened at feeding troughs, the dust and the rubbing due to jostling lessen their skin value to a considerable extent.

Troughs for feeding oats to sheep should be fully 12 inches wide, and the sides 4 to 6 inches high—the width allows for carelessness of lads and general farm hands when emptying oats into the troughs; this width also allows sheep to feed facing one another. Some farmers use old railway sleepers—one laid on its flat and one each side on edge, and kept in position with short stakes. It is usual to allow twelve inches to the sheep; 50 feet will allow 100 hundred sheep to feed.

Among other plans is one where ridging iron fastened inside a rough frame is used. One farmer near Avoca has adopted this method. He solders ends to them, and when the troughs are filled with oats, pours boiling water on the oats a few hours before letting the sheep in to feed; even cold water is better than not soaking them at all. By this means he fattens broken-mouthed, old crossbred and merino ewes in a very short space of time.

If sheep are to be fattened exclusively on oats, it will take 1½ lb. to 2 lb. per day to fatten a thick-set 60-lb. crossbred. The thicker set they are the less time they will be fattening; long-legged, narrow-framed sheep take longest to fatten, all else, such as health, &c., being equal. If these 60-lb. sheep be bought very poor, it will take fully ten weeks to make them fat, and fourteen weeks to make them prime; it will take longer in winter, and less time in warmer weather. If the sheep are at all unhealthy, the fattening period will be longer still. For an average period of twelve weeks, they will eat about 4 bushels per head. At 1s. 6d. per bushel on rails, this means 6s.; so that each sheep, estimating the average cost of them in the first place at 8s., will then stand at 14s. cost, and will at that price have earned 1s. 6d. per bushel for the oats. It will not take more than an hour per day to attend them. For 300 sheep the cost for labour would be about 3d. per head.

To earn 2s. per bushel, the sheep should sell at 16s., which is about the average value of a sheep of this weight during winter months in average seasons. With the addition of railway freights, commission, &c., the sheep would need to bring more money still.

One of the ways that feeding will pay is in buying up good sorts of crossbred lambs or weaners in the wool. During October, November, and December, many lambs not suitable quality for freezing may be obtained. These could be shorn and then fattened; the wool will in most years average 3s. to 4s. per head.

With grown sheep the difficulty is that they are usually cheapest off shears, and through the summer. If these are fattened on oats they will be ready at the end of summer, and fat sheep at that time are not selling well. If they can be bought in the autumn and fattened for July and August months, they may be made to pay well.

The best buying of late years has been in roomy, good-framed ewes, of almost any breeding, 5 and 6 years old, and even 7 years if they are coarse crossbreds. These have been purchaseable at from 6s. to 8s. each. Some farmers buy these early and join their own rams to them. They then know what class of lamb they can expect. These ewes are put into grass or stubble paddocks, and, if found necessary, as is usually the case, oats are fed to them and they steadily improve. As they lamb in July and August, they should be cut off each day or two, and the ram lambs castrated at once, so that they will suffer no check later on. They should be tailed with the searing-iron later—at same time as the ewe lambs.

Fodder crops, such as a mixture of rape and oats, or turnips, sown in the previous autumn, are usually coming to their best during August and September. The ewes put on these crops with their lambs will fatten at the same time as the lambs. The ewes, when dried off their milk on natural pasture for a week after the lambs are sold, can be sold fat also. Farmers in this way can clear from 15s. to 20s. per ewe.

The difficulty has been to keep these ewes over from the summer months (the time they can be bought cheapest) until July and August. By feeding oats, this can be managed, and larger numbers fattened on spring feed than was possible under former management. Very few farmers in closely settled districts have enough spare grass land to carry over dry sheep in any numbers, and improve them steadily all the time, without feeding. In this way, oats can be made to return more than 2s. per bushel, but of course the whole trouble has been to get the right class of sheep.

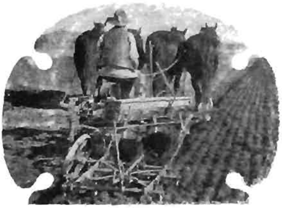
Aged ewes, if fed well, are the best of mothers. It will not pay farmers to buy young crossbred ewes to turn on fodder crops. Graziers can give more for these, as they can raise a fair lamb and a good fleece

per year from off natural pasture. It is only when becoming too aged to thrive on scanty feed that they can be sold to farmers at a price to pay for oat feeding and finishing off finally on fodder crops.

Sheep of the above breeding are too scarce for oat feeding to be practised widely. There are not nearly enough suitable ewes in the country for raising the primest quality export lamb from. It will not be the worst thing that can happen if lamb prices are so low as to make it more profitable for graziers to keep ewe lambs bred from merino ewes by longwool rams in the country. These and further longwool crosses make the best ewes for lamb-raising. It is the lamb from merino mothers, by longwool rams, that, broadly speaking, produces most of our second and third quality carcasses known as Australian quality. It has been the superior skin on the five and six months old lambs of this cross (together with by-products) that has induced exporters to gamble in this class of lamb. Now everything points to young ten to sixteen week old quality lamb being demanded, or else the old style lamb being taken at a ridiculously low price.

This ten to sixteen week old sappy lamb is never likely to be long in store, as it is always saleable. It is the enormous shipments of second and third quality lamb carcasses (teg mutton, really) from Australia, Argentine, and the North Island of New Zealand, that are really the cause of the present trouble. It is ewes mainly of this breeding that suit farmers best for oat feeding and fodder crop work, and they, in their turn, on fodder crops, produce and rear the quality lamb that, at from ten to sixteen weeks, has been sold time after time, not as Canterbury lamb exactly, but as Canterbury quality.

Oats are necessary feed in wet districts. The grass through the winter months becomes very watery and innutritious, and so do fodder crops (especially turnips). This fact, together with sheep being always cold through the fleece being continually damp, and, what is worse, for months together being unable to find a dry place to camp, and having to stand and move about on water-logged ground, renders it necessary to feed oats. These conditions are the cause of most of the losses in in-lamb ewes, and also of the present troubles that sheep are undergoing in Gippsland, and other heavy rainfall areas where the soil is of a retentive nature. Oats fed to sheep in these districts two or three times a week, beginning early in the winter, together with a little attention to better camping-ground, will do more to counteract the evil results that come now through innutritious feed and discomfort, than all the licks and drenches ever introduced.



VICTORIA IN LONDON.

A noteworthy event of the current year has been the official opening of the new offices of the Government of Victoria in London. The ceremony was performed by the Colonial Secretary, the Right Hon. the Earl of Crewe, and attracted a considerable amount of attention throughout the United Kingdom.

VICTORIA'S NEW LONDON OFFICES.

The building consists of six storeys and is erected on land leased for 99 years from the London County Council, having a frontage of 65 feet to Melbourne Place, and 25 feet to the Strand. This 25 feet is the western portion of a frontage of 195 feet 6 inches between Melbourne Place and the eastern corner where Aldwych joins the Strand. The whole front had to be designed so that the new building should form a suitable part of the complete scheme which has been approved by the London County Council and is here illustrated.

The architect, Mr. Alfred Burr, F.R.I.B.A., when explaining the design of the building, said—

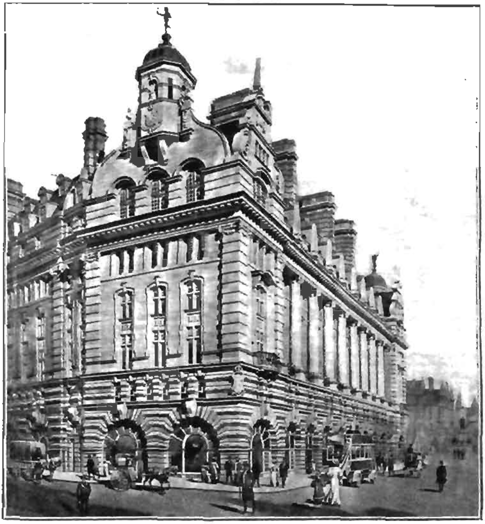
> I venture to think that, if the remainder of the block were erected and occupied by the Commonwealth of Australia and the five other States, the complete building would make a London home worthy of the Commonwealth.

In addition to the offices of the Agent-General (the Hon. J. W. Taverner) and his staff, a reading and rendezvous room has been provided, and will be much appreciated by Victorians resident in or visiting London. Two spacious exhibit rooms and three large windows provide ample accommodation for effective displays of the varied products of the State.

Before he declared the new offices open for the transaction of business, Lord Crewe said—

> I have to congratulate the Government of Victoria on securing a site for their offices in an exceptionally favourable position, between the west of London and the city. When the Agent-General turns his steps westward he can engage in the semi-diplomatic activities of his office, activities to which, so far as the Colonial Office is concerned, I am happy to think, are always of a cordial and friendly character. If he turns eastward, he finds himself almost immediately at the centre of the commercial activities which form a large part of the duties of his office.

I believe I may also congratulate the Government on having obtained their site on favourable terms, and I can heartily felicitate them upon the use which they have made of it. This great building is worthy of the great State whose interests in England are here conducted and managed. We are all of us proud of Victoria as a State of the Empire, of its large and energetic population, and its noble capital, its prosperous commerce, as Mr. Taverner has told us, largely carried on with the Mother Country. We wish the State of Victoria a series of favourable seasons, and an ever-increasing volume of trade.



THE COMPLETE SCHEME.

The official address of Victoria's representative is "The Agent-General for Victoria, Melbourne Place, Strand, London, W.C., to which residents of the United Kingdom should forward all inquiries relative to the State, its resources and trade.

—A. T. S.

THE TOMATO WEEVIL.

(*Desiantha novica*, Lea.)

C. French, jun., Assistant Government Entomologist.

In the *Journal* for December, 1908, attention was drawn to a new vegetable pest that was causing considerable annoyance to growers of tomato plants at Ascot Vale, Essendon, and Preston. As the insect has extended its field of operations so much of late, it is thought advisable to again draw attention to it. In addition to the places above mentioned, the Tomato Weevil has now been found at Camberwell, Flemington, Williamstown, and other parts of the metropolitan area, and has been playing great havoc with garden plants and vegetables.

The larva is of a light pea-green colour, measuring about a quarter of an inch in length, and is found in the soil, usually a few inches below the surface. When about to pupate or turn into the chrysalis it constructs a cocoon made of soil, where it remains for a couple of months until it emerges as the perfect insect. The perfect insect varies in colour from light grey to dark brown, some specimens having a V-shaped mark on the wing cases. It is quite as destructive as the larva, and, like it, goes down into the soil in the day time, coming up at night to feed. The larvæ often feed in the daytime as well as at night, but the perfect insects rarely do so.

Remedies.—As the weevils are in the ground close to the plant, I would recommend that the soil be forked up for a couple of inches round the plant. This will expose the larvæ and perfect insects, which will in many instances be destroyed by native insectivorous birds, fowls, ants, &c.

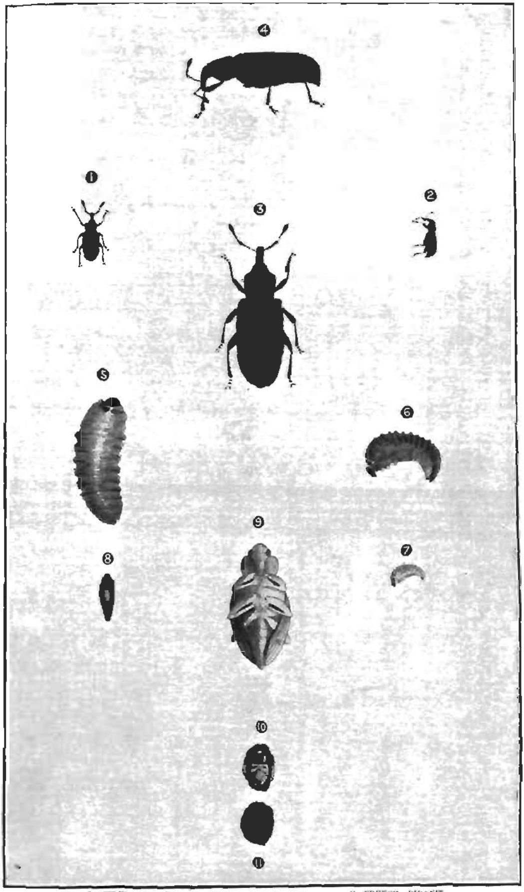
Spraying garden plants with arsenate of lead has been tried with good results, but great care must be taken that the vegetables are washed before being used. Placing poultry in coops close to tomato or other plants would be beneficial, as the insects being just under the surface of the soil are easily scratched up and devoured. Another plan is to place a piece of newspaper under the plants at night, and take a lantern or any light out amongst the plants; when the insects see the light they fall on the paper and can be gathered up and destroyed. A friend of mine states that by this means he collected some thousands of weevils in a week.

As the insect is partial to the common Marsh Mallow, any of these plants growing on vacant land adjoining gardens should be destroyed. The Marsh Mallow is also a harbour for the Harlequin Bug and other noxious insects.

The Tomato Weevil is a prolific breeder, and every possible means should be adopted to prevent its spread; it may be seen at all times throughout the year, and the damage done is considerable.

EXPLANATION OF PLATE.

Fig.
1.—Perfect insect. (Natural size.)
2.—Perfect insect. (Natural size, side view.)
3.—Perfect insect. (Enlarged.)
4.—Perfect insect. (Enlarged, side view.)
5.—Larva. (Enlarged.)
6.—Larva. (Enlarged, side view.)
7.—Larva. (Natural size, side view.)
8.—Larva. (Natural size, side view.)
9.—Pupa. (Enlarged.)
10.—Pupa in cocoon. (Natural size.)
11.—Cocoon. (Natural size.)



C. C. BRITTLEBANK, DEL. C. FRENCH, DIREXIT.

THE TOMATO WEEVIL.

(*Desiantha novica*, Lea.)

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture, Percentage.	Nitrogen		Phosphoric Acid.							
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
			%	%	%	%	%	%	%	%	%	%	%
542	Superphosphate, Federal O.S.	Aust. Explosives and Chemical Coy.	8.10	..	..	15.75	17.00	2.10	1.00	1.52	2.00	19.37	20.00
550	..	..	7.95	..	..	17.13	17.00	2.44	1.00	1.42	2.00	20.99	20.00
643	..	..	5.93	..	..	16.76	17.00	2.84	1.00	0.93	2.00	20.53	20.00
527	..	..	5.70	..	..	15.96	17.00	1.75	1.00	1.02	2.00	18.73	20.00
532	..	..	7.48	..	..	18.28	17.00	1.25	1.00	1.98	2.00	21.51	20.00
505	..	..	5.93	..	..	16.76	17.00	1.42	1.00	1.07	2.00	19.25	20.00
511	..	..	9.25	..	..	16.24	17.00	2.33	1.00	1.43	2.00	20.00	20.00
598	..	..	10.24	..	..	15.72	17.00	2.94	1.00	3.40	2.00	22.06	20.00
586	..	..	9.33	..	..	16.64	17.00	2.35	1.00	2.18	2.00	21.17	20.00
590	..	..	9.92	..	..	16.40	17.00	2.24	1.00	1.89	2.00	20.53	20.00
601	..	..	10.13	..	..	16.05	17.00	2.08	1.00	1.57	2.00	19.70	20.00
620	..	..	7.90	..	..	15.35	17.00	3.14	1.00	1.30	2.00	19.79	20.00
525	Superphosphate, Florida	Cuming, Smith, and Coy.	8.78	..	..	17.02	17.00	1.72	1.00	2.30	2.00	21.04	20.00
529	..	..	9.81	..	..	16.11	17.00	1.45	1.00	4.37	2.00	21.63	20.00
502	..	..	9.19	..	..	17.16	17.00	2.47	1.00	3.41	2.00	23.04	20.00
507	..	..	7.68	..	..	16.57	17.00	2.15	1.00	4.18	2.00	22.90	20.00
573	..	..	8.57	..	..	14.01	17.00	3.26	1.00	4.44	2.00	21.71	20.00
603	..	..	10.64	..	..	14.50	17.00	3.67	1.00	4.10	2.00	22.27	20.00
664	..	..	11.47	..	..	16.20	17.00	2.43	1.00	3.48	2.00	22.11	20.00
595	..	..	11.93	..	..	16.32	17.00	2.65	1.00	3.22	2.00	22.19	20.00
552	..	..	7.75	..	..	14.80	17.00	3.88	1.00	3.87	2.00	22.55	20.00
555	..	..	9.01	..	..	16.44	17.00	2.18	1.00	4.23	2.00	22.85	20.00
610	..	..	10.10	..	..	15.96	17.00	2.85	1.00	3.62	2.00	22.43	20.00
591	..	..	10.04	..	..	14.94	17.00	3.20	1.00	4.11	2.00	22.25	20.00
583	..	..	9.53	..	..	13.84	17.00	4.18	1.00	4.11	2.00	22.13	20.00
606	..	..	9.43	..	..	16.16	17.00	2.85	1.00	3.34	2.00	22.35	20.00
613	..	..	10.12	..	..	14.85	17.00	2.94	1.00	4.27	2.00	22.06	20.00
615	..	..	10.35	..	..	14.06	17.00	2.80	1.00	5.02	2.00	21.88	20.00
617	..	..	10.63	..	..	14.37	17.00	2.84	1.00	4.79	2.00	22.00	20.00
618	..	..	10.68	..	..	14.75	17.00	3.17	1.00	4.05	2.00	21.97	20.00
671	Superphosphate, Ordinary	H. J. Feore and Co.	6.63	..	..	16.35	17.00	2.00	1.00	4.21	2.00	22.65	20.00

594	Superphosphate, Jap. ..	A. H. Hasell	11.39	..	..	17.65	18.00	0.89	1.00	0.47	1.00	19.01	20.00
582	" "	"	8.19	..	..	18.99	18.00	1.53	1.00	0.39	1.00	20.91	20.00
622	" "	"	10.16	..	..	18.34	18.00	1.62	1.00	0.19	1.00	20.15	20.00
575	" "	"	11.90	..	..	18.18	18.00	1.22	1.00	Trace	1.00	19.40	20.00
533	" "	"	9.77	..	..	18.07	18.00	1.12	1.00	0.86	1.00	20.05	20.00
501	" "	"	10.65	..	..	18.31	18.00	2.16	1.00	0.79	1.00	21.26	20.00
599	" "	"	13.25	..	..	18.96	18.00	1.07	1.00	0.24	1.00	20.27	20.00
600	" "	"	12.59	..	..	17.87	18.00	1.80	1.00	0.40	1.00	20.07	20.00
663	" "	"	14.80	..	..	18.82	18.00	1.35	1.00	0.26	1.00	20.43	20.00
572	" "	"	9.16	..	..	18.07	18.00	1.94	1.00	0.44	1.00	20.45	20.00
545	" "	"	11.80	..	..	19.41	18.00	0.93	1.00	0.26	1.00	20.60	20.00
609	" "	"	11.66	..	..	18.03	18.00	0.88	1.00	0.71	1.00	19.62	20.00
557	Superphosphate ..	J. Kitchen and Sons	11.43	..	..	16.01	...	2.60	...	3.62	...	22.23	20.00
623	Superphosphate, No. 1 Ordinary	Mt. Lyell Mining and Railway Coy.	6.80	..	..	15.80	17.00	2.34	1.00	2.56	2.00	20.70	20.00
596	" " "	" "	8.19	..	..	16.03	17.00	2.25	1.00	2.26	2.00	20.54	20.00
561	" " "	" "	9.82	..	..	18.24	17.00	1.63	1.00	2.10	2.00	21.97	20.00
548	" " "	" "	8.70	..	..	16.12	17.00	2.88	1.00	1.86	2.00	20.86	20.00
530	" " "	" "	8.01	..	..	17.81	17.00	0.93	1.00	2.55	2.00	21.29	20.00
506	" " "	" "	6.92	..	..	17.97	17.00	1.34	1.00	2.51	2.00	21.82	20.00
509	" " "	" "	8.37	..	..	17.58	17.00	1.36	1.00	2.56	2.00	21.50	20.00
515	" " "	" "	7.87	..	..	17.92	17.00	1.38	1.00	2.50	2.00	21.80	20.00
570	" " "	" "	8.88	..	..	17.44	17.00	1.77	1.00	2.66	2.00	21.87	20.00
577	" " "	" "	9.24	..	..	17.07	17.00	2.07	1.00	1.70	2.00	20.84	20.00
612	" " "	" "	6.58	..	..	18.25	17.00	1.33	1.00	2.08	2.00	21.66	20.00
605	" " "	" "	9.35	..	..	16.60	17.00	2.08	1.00	2.49	2.00	21.17	20.00
619	" " "	" "	9.46	..	..	16.03	17.00	2.34	1.00	1.64	2.00	20.01	20.00
641	Superphosphate, Ordinary ..	Peter Rohs	8.90	..	..	11.80	..	4.25	...	1.35	...	17.40	..
640	" "	"	10.06	..	..	10.48	..	4.85	...	1.12	...	16.45	...
564	*Superphosphate, No. 1 Ordinary*	*Wischer and Coy.*	6.80	..	..	17.13	17.00	1.77	1.00	2.54	2.00	21.44	20.00
518	" " "	" "	7.33	..	..	17.07	17.00	1.70	1.00	3.29	2.00	22.06	20.00
536	" " "	" "	7.42	..	..	16.74	17.00	0.70	1.00	3.37	2.00	20.81	20.00
503	" " "	" "	8.16	..	..	15.59	17.00	2.39	1.00	2.89	2.00	20.87	20.00
510	" " "	" "	4.61	..	..	17.07	17.00	1.53	1.00	2.68	2.00	21.28	20.00
514	" " "	" "	6.19	..	..	15.22	17.00	2.47	1.00	3.26	2.00	20.95	20.00
662	" " "	" "	7.22	..	..	15.00	17.00	2.08	1.00	4.16	2.00	21.24	20.00
624	" " "	" "	9.24	..	..	16.30	17.00	2.12	1.00	4.90	2.00	23.32	20.00
569	" " "	" "	7.90	..	..	15.30	17.00	1.75	1.00	2.86	2.00	19.91	20.00
597	" " "	" "	5.74	..	..	15.53	17.00	2.22	1.00	1.93	2.00	19.68	20.00
584	" " "	" "	9.50	..	..	14.27	17.00	3.06	1.00	5.50	2.00	22.83	20.00
608	" " "	" "	8.02	..	..	16.46	17.00	2.96	1.00	5.04	2.00	24.46	20.00
604	" " "	" "	10.61	..	..	18.89	17.00	1.57	1.00	0.78	2.00	21.24	20.00
579	" " "	" "	4.45	..	..	15.51	17.00	1.79	1.00	2.18	2.00	19.48	20.00
584	" " "	" "	8.33	..	..	14.31	17.00	2.87	1.10	5.68	2.00	22.86	20.00
673	Bonedust and Superphosphate	J. A. Dundas ..	6.12	1.40	1.50	7.65	6.12	8.16	8.26	2.05	2.82	17.86	17.20
593	Dissolved Bones	Cuming, Smith, and Coy. ..	8.84	0.90	1.00	9.21	10.01	5.30	3.88	9.45	5.48	23.96	19.37

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture. Percentage.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.			
				Found.	Guaranteed.	Found.	Guaranteed.	Fine.		Coarse.	
								Found.	Guaranteed.	Found.	Guaranteed.
			%	%	%	%	%	%	%	%	%
512	Bonedust, Federal	Aust. Explosives and Chemical Coy.	5.21	3.00	3.00	19.52	18.00	49.7	30.00	50.3	70.00
528	,, ,,	,, ,, ,, ,, ,,	5.91	3.00	3.00	19.32	18.00	49.4	35.00	50.6	65.00
566	Bonedust	Cuming, Smith, and Co.	6.25	3.01	3.00	21.21	18.00	53.5	35.00	46.5	65.00
588	,,	,, ,, ,,	5.58	2.61	3.00	22.23	18.00	54.3	35.00	45.7	65.00
633	,,	,, ,, ,,	7.75	2.56	3.00	18.36	18.00	50.4	35.00	49.6	65.00
676	Blood and Bonedust	,, ,, ,,	8.87	5.60	5.20	12.55	10.00	59.4	..	40.6	
677	Bonedust	J. Cockbill	7.81	4.50	3.50	18.67	18.25	37.8	31.43	62.2	68.57
674	,,	J. A. Dundas	13.11	3.06	3.00	18.59	18.00	33.1	54.65	66.9	45.35
516	,,	J. R. Elsworth	7.60	3.54	3.00	20.02	19.00	54.6	..	45.4	..
630	,,	,,	8.40	3.43	3.00	17.28	19.00	48.5	..	51.5	..
634	Bonedust, Eureka	,,	9.71	3.41	3.00	18.80	19.00	41.2	40.00	58.8	60.00
639	Bonedust, Magic	G. Gardiner	8.89	1.30	3.00	14.66	16.00	58.6	21.00	41.4	79.00
522	Bonedust, Bullock Brand	Heinz Bros.	6.99	3.44	2.76	18.82	22.48	59.0	77.00	41.0	23.00
521	,,	J. Holdsworth	7.13	3.64	4.38	19.01	17.72	46.5	30.60	53.5	69.40
517	,,	J. R. Jopling	8.09	4.50	4.00	19.06	20.00	27.2	6.55	72.8	93.45
558	Bonedust, Waddell	J. Kitchen and Sons	7.54	3.37	3.00	19.67	18.00	39.2	38.00	60.8	62.00
631	,, ,,	,, ,, ,,	6.86	3.91	3.00	17.36	18.00	44.3	38.00	55.7	62.00
675	,, ,,	,, ,, ,,	6.38	3.12	3.00	18.57	18.00	40.0	38.00	60.0	62.00
539	Bonedust	Mt. Lyell Mining and Railway Coy.	6.40	3.30	3.00	20.25	18.00	31.5	38.00	68.5	62.00
540	,,	,, ,, ,, ,, ,,	9.88	3.08	3.00	22.12	18.00	38.0	38.00	62.0	62.00
538	,,	A. Murphy	8.25	3.48	2.49	15.33	15.75	48.2	45.90	51.8	54.10
565	,,	Peter Rohs	8.57	4.42	4.62	19.36	20.65	56.0	56.50	44.0	43.50
635	,,	,,	13.06	4.03	4.62	19.53	20.65	31.3	56.50	68.7	43.50
637	,,	,,	11.52	4.48	4.62	18.51	20.65	34.9	56.50	65.1	43.50
563	,,	Wischer and Co.	7.12	2.89	3.00	19.65	18.00	35.0	30.00	65.0	70.00
541	Bonedust, Indian	,, ,,	7.01	3.51	3.50	22.29	19.00	Nil	Nil	100.0	100.00

Government Laboratory,
Melbourne, 13th September, 1909.

P. RANKIN SCOTT,
Acting Chemist for Agriculture.

PIG-RAISING.

W. Smith, Pig Expert.

Farmers will study their own interests if they take up pig-raising, as there is nothing so profitable on the farm as the pig. If it is the right thing to have a dairy farm, then it is also imperative to grow pigs, for the simple reason cows and pigs should always be run together, as a business.

When growing root crops and green fodder for his cows the farmer can easily grow a little extra for his sows and young pigs. If he studies the right breed of pigs he can increase his income four-fold; not only that, he will be giving the land manure in abundance.

There is need for a great increase in pig-raising, if an extensive export trade is to be created, and the local demand maintained on its present profitable basis. Great Britain pays annually £19,000,000 to foreign countries for pig products. Pork has been successfully exported to London, and that market would take a large quantity at profitable rates, if it were available. But the present condition of the industry holds out no promise of an oversea trade being developed as we are scarcely able to keep up supplies for the expansion in Australian consumption, which is ever on the increase, especially for Victorian pork, hams and bacon.

The census of 1901 showed that there were 350,370 pigs in Victoria, in 1905 the number had dropped to 286,070, in 1906 to 273,682, in 1907 to 220,452, and in 1908 to 211,000. In the last issue of the *Victorian Year-Book* the Government Statist, in referring to the live stock in Australia in 1907, stated that the most striking feature was the all-round decrease in the number of pigs. As compared with 1905, the reduction was as much as 25 per cent. in Tasmania and Western Australia, 22 per cent. in New South Wales, 20 per cent. in Victoria, 16 per cent. in Queensland, and 9 per cent. in South Australia. All other stock showed an increase.

In 1901 there were 231,752 pigs slaughtered in Victoria, and 13,204,547 lbs. of bacon and hams manufactured in the factories and on the farms. In 1905, the numbers had risen to 248,568 slaughtered, and 16,433,655 lbs. of bacon and hams made; in 1906 there was a further increase of 273,391 pigs slaughtered, and an output of 18,051,166 lbs. of bacon and hams. The fact is a great improvement has taken place during the last few years in the methods of feeding, and fattening of pigs, and in the process of manufacturing the products. This, in turn, has led to an increase in the demand for these goods, even though the prices charged for them are higher than they were ten years ago. It is this increase in the demand for bacon, hams and pork, because of the uniformly high quality they have attained in this State, which enables such high prices to be paid for pigs. At the Franco-British Exhibition, the Victorian pigs were greatly admired, and gained the highest awards possible, viz., the grand champion prize against the world, as frozen pork, as well as hams and bacon.

Breeding and Feeding.

The best breed is the Yorkshire and Berkshire cross. The Yorkshire boar should be pure bred; the sow should be of the Berkshire type, half to three-quarter bred with plenty of size and well-shaped ham, deep ribbed, straight back, small head, good bone not too large, and close to the ground, with well-shaped feet, and plenty of hair, twelve teats, and of good breeding quality. Both sexes should be at least eight months old before they are allowed to breed. Get as many litters as you can; keep the sow

in good condition but not too fat. The average litter from good sows should be about eight; you can get five litters of eight pigs in two years, say, twenty pigs per sow per year. I never advise selling pigs at two months; keep them till they are five months' old, and about 140 lbs. weight—at 6d. per lb. they will return £3 10s. each, or a gross return of £70 per year from one sow. If ten sows and one hog are kept on the farm, and have the same average, the gross income would be £700 per year.

A few days before farrowing give the sow half a pint of castor oil in her food; a week afterwards give her a packet of Epsom salts. The young pigs should be weaned at six to eight weeks old, not later. Castrate the male pigs at three weeks; do not allow the young pigs to loose their baby fat, but keep them going right from the start. If milk is available, sterilize by heating to 180 degrees, mix with wheat or barley crushed, and boiled potatoes; the water in which the potatoes are boiled should be thrown away. Mix the food well into a sloppy condition for young pigs. When they are three months, make it more stiff by putting less liquor with it. When four months old, give plenty of dry food. A suitable ration is one gallon of milk, 3 lbs. of potatoes, and 4 lbs. of crushed barley or wheat per pig per day. At this age they should make 15 lbs. per week, if well looked after, and at the end of five months should weigh 140 lbs. If peas are available, a pint of peas per day is a great improvement, before being marketed, as it improves the appearance of the skin, and makes the flesh more solid. It is essential to provide plenty of clean water in a separate trough for the pigs to drink; also to have plenty of charcoal and a piece of rocksalt in the stye.

Always sterilize the milk fed to pigs. This is of great importance as it is a safeguard against the transmission of tuberculosis and other diseases to pigs. Green barley, rape, and lucerne are excellent for sows and young pigs; mangolds and sugar beet are also very good. Give a little bran in the food occasionally.

SUMMARY OF BREEDERS' OPINIONS.

The opinions of 30 Victorian pig-breeders were given recently in the *Australasian*. Fifteen favoured the Yorkshire and Berkshire cross; eleven, pure Berkshires; two, a cross between the Tamworth and Berkshire; and one, a cross between the Yorkshire and Tamworth, doubtless the Tamworth which at one time was preferred in Victoria to all other breeds. It has, however, receded in popular favour, because it showed a tendency to weakness of constitution brought about by inbreeding. Crossing with a Yorkshire appears to give stamina and rapidity of growth to progeny.

An interesting point brought out in the discussion is the relative gain in using a Yorkshire boar with Berkshire sows in preference to a Berkshire boar with Yorkshire sows. With the Yorkshire boar there is the great advantage that all the young ones will be white, and of fairly good type; the cross used the other way, that is to say, a Berkshire boar and Yorkshire sow, gives pigs of all colours—some white and some black, others spotted, and a number untrue to the type of either parent. On the other hand, several contributors point out that the Yorkshire sow is a better mother than the Berkshire, and raises larger litters successfully. In using the Yorkshire as pure breeds, or in crossing, I prefer the middle Yorkshire. He is a quick grower and better shaped and more hardy for this climate as he grows plenty of hair, and has a finer skin than pigs of any other breed.

With respect to the age at which pigs should be allowed to breed opinions were almost unanimous, *i.e.*, that sows should not farrow before they are twelve months old.

BUILDING HINTS FOR SETTLERS.

II.—Plan, Specifications and Quantities of a Pig-stye.

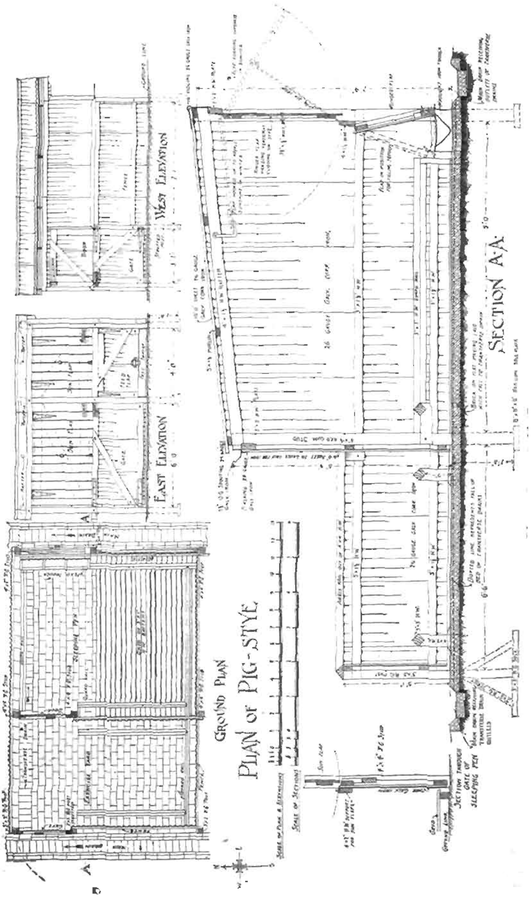
A. S. Kenyon, C.E., Engineer for Agriculture.

The accompanying design is based on the pig-styes of the Geelong Harbor Trust Commissioners' Irrigation Farm at Sparrovale, Geelong. These are very simple in construction, can be built cheaply and fulfil all the requirements for proper sanitation. The essentials of a pig-stye are that it can be easily kept clean, that it be free from draughts and that the sun and fresh air can be let into all parts of it. The sleeping pen should face the east, so that when the sun flaps are open, and admitting plenty of fresh air, there may be shelter from the hot afternoon sun.

Excavate the ground to a depth of 5 inches over the whole of the site and 2 inches extra for main drains, leaving the surface of the ground even to start brick paving. Holes for studs and posts to be excavated to a depth of at least 1 ft. 10 in., but should be deep enough to obtain a solid bottom.

Pave the floor with bricks laid flat on a 2-in. bed of sand. Bricks to have ¼-in. joints grouted with mortar composed of one part of cement to two parts of sand. Lay the floor with a fall of 1 inch in 10 feet to transverse drain which is to be laid with a fall to the east and west into main drains, the sleeping pen draining into east main and the exercise yard into west main drain. The main drains and floors are shown in drawing with the fall from south to north, but the fall should be in the same direction as the natural fall of the ground. Should the natural slope be in the opposite direction to that shown, then the gate of exercise yard, door of sleeping pen, feed trough and transverse drain will be at the south end; the gate and grid of sleeping pen will be at north end. In this case, the 3-in. x 1½-in. battens, rafters and corrugated iron will be on the south side of studs. The main drains are formed of ordinary bricks, on the bottom laid with their length (9 inches) across the drain and a splayed brick at each side as shown in drawing. The transverse drain is 9 inches wide and formed of ordinary bricks sunk in floor as shown.

The studs of 4-in. x 4-in. red-gum are 9 feet long on east wall and 8 feet on west wall, resting on 8-in. x 8-in. x 2-in. red-gum sole plates. The posts will then be 1 ft. 8 in. in the ground. The fence posts are 3-in. x 3-in. x 4-ft. 9-in. red-gum; the two end posts are set on 8-in. x 8-in. x 2-in. red-gum sole plates and the centre one strutted with two 3-in. x 2-in. x 21-in. red-gum struts well nailed to post and 3-in. x 2-in. x 2-ft. 6-in. red-gum sole plate. Great care must be taken to set studs and posts perfectly upright and well ram the earth put back. In ramming, only a small portion is to be put back at a time and then rammed before putting in any more, a little water being poured in when ramming. The studs are checked on the outside ½-in. x 5-in. wide (the top of check being 3 inches from top of stud) for 5-in. x 2-in. plates, and bolted to plates with one 6-in. x ½-in. bolt to each stud, the plate on west wall being countersunk for heads of bolts. Fix to inside of studs of east wall with one 6-in. x ½-in. bolt to each stud a 4-in. x 1½-in. hardwood support for sun flaps, the bottom of support being 2 ft. 10 in. above ground line, which is 20-in. from bottom of studs and posts. With one 6-in. x ½-in. bolt to each stud and one 5-in. x ½-in. bolt to each post secure two 3-in. x 1½-in. battens horizontally to studs and posts, the tops of battens on north and south wall and bottoms of battens on west wall and fence being 5 inches and 2 ft. 10 in. above ground line. It


West Elevation
East Elevation
Section A-A
Ground Plan
Plan of Pig-Stye

is advisable, although not absolutely necessary, to check the studs and posts ½ inch for these battens.

Check the rafters on to plates as shown and secure, with one 6-in. x ½-in. bolt, to each stud the three rafters coming alongside the studs. Well skewnail the intermediate rafters with 3-in. nails to top plate. Secure, with one 3-in. nail, to each rafter the four purlins spaced at equal distances. Secure arris rail to top of fence with 3-in. nails, the ends of arris rails against wall to be supported on 3-in. x 3-in. hardwood checked ½ inch on to rail and bolted with one 3½-in. x ½-in. bolt. Guard rail to be fixed on four sides of sleeping pen and three sides of exercise yard except in front of exercise yard gate, door and trough. The bottom of rail to be 9 inches from floor, supported on 4-in. x 2-in. red-gum supports well nailed to fence and walls where possible, and elsewhere sunk into brickwork and tightened with cement. The ends of guard rails on each side of doorway in sleeping pen to be supported on 4-in. x 2-in. red-gum let ½ inch into studs and bolted with one 6-in. x ½-in. bolt to each.

Door, gates and feed flap to be constructed of 4-in. x 1½-in. hardwood styles, rails and braces. The styles and rails are to be halved together and secured with 2-in. x ⅜-in. bolts. The braces are to be halved on to styles and rails and secured with 3-in. x ⅜-in. bolts. Where bolts come beneath hinges or barrel bolts, countersink for heads, and screw up from other side, if necessary taking bolt through iron. Gate to exercise yard and door to be hung on 14-in. heavy Scotch tee hinges, fastened with 8-in. barrel bolt and to have 2-in. x 1-in. hardwood stops well nailed to studs and posts. Gate to exercise yard to have 3-in. x 1½-in. hardwood cap well nailed to top rail. Gate to sleeping pen to be fastened with one 8-in. barrel bolt and to swing on one pair of 18-in. strap hinges secured with ¼-in. bolts to rails and hung on hooks driven through studs. The top hook to have threaded end and to go through stud and be secured with a nut and washer. Stops to be 5-in. x 1-in. hardwood nailed to inside of studs. The feed flap to be hung from inside of support for sun flaps on one pair of heavy Scotch tee hinges and to be furnished with a flat bolt as shown to secure to feed trough.

Construct sun flaps of 6-in. x 1-in. pine ledges and braces covered with 6-in. x ⅝-in. T. and G. and beaded lining, all to be well nailed together with 2-in. nails well clinched. Flaps to be hung from inside of plate with one pair of heavy Scotch tee hinges to each flap and fastened with 8-in. barrel bolts. Provide, for each flap, one ¾-in. diameter wrought-iron rod having eye at each end, the eye at loose end to be bent at right angles to rod and the other end secured with stout staple to support. One 3½-in. x ½-in. bolt to be fixed through centre of each flap with heads and ¾-in. iron washer on outside and other end projecting beyond nut on inside for the purpose of going through bent eye of rod when flap is in position to form sun shade. Secure to rafter over the centre of each flap a wrought-iron hook, as shown, bolted to rafter with 3-in. x ½-in. bolt.

Construct grid 9 ft. 3 in. x 5 ft. 8 in. of four 3-in. x 2-in. hardwood bearers on edge spaced 2 ft. 9 in. apart covered with twenty 3-in. x 1-in. hardwood battens, equally spaced, secured to bearers with 2-in. nails well driven home. It will be possible for a grid this size to be drawn under guard rails out of the gate when it is necessary to clean under it.

Cover the roof with six 10-ft. sheets of 26-gauge corrugated galvanized iron giving 1½ corrugations lap, and secure to purlins at every second corrugation with 2-in. galvanized iron spring head nails. Cover the angle of roof and east wall with 26-gauge galvanized iron 18-in. ridging giving

5-in. lap, and secure with spring head nails on top every 18 inches to purlins *and on side to end of each rafter.* Cover the fence and walls with 26-gauge corrugated iron lapped $1\frac{1}{2}$ corrugations and secured with spring head nails to 3-in x $1\frac{1}{2}$-in. battens, end rafters and plates at every second corrugation. Cover the gates, door and feed flap on inside with 26-gauge corrugated iron secured to rails with spring head nails the same as for other iron. All iron should be so lapped as to prevent the prevailing wind from blowing between joints. Fix 24-gauge galvanized iron $4\frac{1}{2}$-in. O.G. spouting on top of corrugated iron of west wall secured to end of rafter with a stout galvanized iron strap. Fix a 6-in. strip of 28-gauge galvanized iron as flashing behind straps of spouting bent under spouting and down wall over corrugated iron. Double solder and rivet joint in spouting and stop ends with plain iron double soldered and riveted. Connect spouting with 3-in. galvanized iron down pipe to tank. Although no tank is provided for in the accompanying quantities it is advisable to have some means of catching water from the roof, especially if there should be more than one stye.

Fix to the underside of rafters with staples 1-in. mesh 10-gauge wire netting. Fill in the space between netting and corrugated iron of roof with straw. This is for the purpose of catching the drips caused by condensation and to keep the pen cool in summer. Paint sun flaps both sides three coats of oil paint.

The following is a list of the materials required for the erection of a single pig-stye:—

Red-gum—
- 8-in. x 2-in. : 8 8-in., sole plates.
- 4-in. x 4 in. : 3 9-ft., 3 8-ft., studs.
- 4-in. x 2-in. : 10 1-ft. 3-in., supports for guard rail.
- 3-in. x 3-in. ; 3 4-ft. 9 in., fence posts.
- 3-in. x 2-in. ; 1 2-ft. 6-in., 2 1-ft. 9-in., sole plate and struts.

Hardwood—
- 5-in. x 2-in. : 2 12-ft., plates.
- 5-in. x 1-in. ; 2 3-ft., gate stops.
- 4-in. x $1\frac{1}{2}$-in : 1 12-ft., 5 10-ft., 2 6-ft., 2 5-ft. 9-in., 1 5-ft., 3 4-ft., 3 3-ft. 6 in. 2 3-ft. 3-in., 7 3-ft., 2 2-ft. 6-in. : support to sun flaps, rafters, styles, rails, and braces.
- 3-in. x 3-in. : 2 9-ft., 2 6-ft., 3 7-ft., guard rail.
- 3-in. x 2-in : 4 5 ft. 3-in., bearers for grid.
- 3-in. x $1\frac{1}{2}$-in. : 4 16-ft. 6-in., 4 12-ft., 4 7 ft. 6-in., 1 3-ft. 1-in., purlins, wall battens and capping for yard gate.
- 3-in. x 1-in.: 20 9-ft. 3-in. battens, for grid.
- 2-in. x 1-in. : 2 3-ft., 2 2-ft. 6-in., door and gate stops.
- Two out of 4-in. x 4 in. : 2 6-ft. 9-in., 1 7-ft. 6-in., arris rail.

White Baltic Pine—
- 6-in. x 1-in. ; 1 6 ft. 6-in., 2 6-ft., 2 4-ft., 1 4-ft. 6-in., sun flap, ledges, and braces.
- 6-in. x $\frac{5}{8}$-in. T. and G. : 20 3-ft. 6-in., sheeting of sun flaps.

Brick Work—
- 725 bricks.
- 60 splayed bricks, for main drains.
- 2 bags cement.
- $1\frac{1}{2}$ *cubic yards sand.*

Ironmongery—
- Corrugated Galvanized Iron—
  - 26-gauge, 4 8-ft., 6 7-ft., 16 6-ft., 6 10-ft.
  - 26-gauve, ridging, 18-in., 2 lengths.
  - 26-gauge, 3-in., dia., down pipe, 2 lengths.
- Plain Galvanized Iron—
  - 28-gauge, 1 72-in. x 24-in.
  - 24-gauge, $4\frac{1}{2}$-in. O.G. spouting, 2 lengths.
  - Straps for spouting, 5.
  - Spring head nails, 4 packets.

Ironmongery—continued.

1 packet of staples, for wire netting.
Wire nails, 5 lbs. 3-in., 3 lbs. 2-in., No. 10.
5 pairs heavy Scotch tee hinges, 14-in.
1 pair hook and strap hinges, top hook threaded, and fitted with nut and washer, and ¼-in. bolts to fix straps.
5 8-in. barrel bolts, with screws.
2 ¾-in. dia. x 3-ft. 6-in. wrought-iron rods, with eye at each end, one eye to be bent at right angles, and 2 stout staples.
1 strong flat bolt, for fastening feed flap.
2 strong wrought-iron hooks for fastening back sun flaps.
19 yds. 1-in.-mesh, 19-gauge, 24-in., wire netting.
One wrought iron feed trough, 4-ft. long.
4 lbs. mixed oil paint.

Bolts, Nuts, and Washers—

30 6 in. x ½-in., 2 3-in. x ½ in.
9 5 in. x ½-in., 12 3-in x ⅜ in.
4 3½-in. x ½-in., 22 2-in x ⅜-in., 2 ¾ in., washers.

The following is a list of material for erection of every additional stye:—

Brickwork, same as for single stye.

Red-gum—

8-in. x 2-in. : 5 8-in.
4-in. x 4-in. ; 2 9-ft., 2 8-ft.
4-in. x 2-in. : 10 1-ft. 3 in.
3 in. x 3-in. : 2 4-ft. 9-in.
3-in. x 2-in. : 1 2 ft. 6-in., 2 1-ft. 9-in.

Hardwood—

5-in. x 2-in.; 2 11-ft.
5-in. x 1-in.; 2 3-ft.
4-in. x 1½-in.; 1 11-ft., 4 10-ft., 2 6-ft., 2 5-ft. 9-in., 1 5 ft., 3 4 ft. 3 3 ft. 6 in., 2 3-ft. 3-in., 7 3-ft.
3-in. x 3-in.; 2 9-ft., 2 6-ft., 3 7-ft.
3-in. x 2-in.; 4 5-ft. 3-in.
3-in. x 1½-in.; 2 16 ft. 6-in., 4 11-ft., 4 7-ft. 6-in., 1 3-ft. 1 in.
3-in. x 1-in.; 20 9-ft. 3-in.
2-in. x 1-in.; 2 3-ft., 2 6-ft.

White Baltic Pine—

6-in. x 1-in.; 1 6-ft. 6-in., 2 6-ft., 2 4-ft., 1 4-ft. 6-in.
6-in. x ⅞-in., T. and G. ; 20 3-ft. 6 in.

Ironmongery—

Corrugated Galvanized Iron—
26-gauge, 2 8-ft., 3 7-ft., 14 6-ft., 6 10-ft.
Ridging, 18-in., 2 lengths.
Plain Galvanized Iron—
28-gauge, 1 72-in. x 24-in.
24-gauge, 4½-in. O. G. spouting.
Straps for spouting, 4
Spring-head nails, 3 packets.
1 packet small staples.
Wire nails, 5 lbs. 3-in., 3 lbs. 2-in., No. 10.
5 pairs Scotch tee hinges, 14-in.
1 pair hook and strap hinges, 18-in., with ¼-in. bolts, and fitted with nut and washer.
5 8-in. barrel bolts, with screws
2 ¾-in. rods, with eye at each end and 2 stout staples.
1 strong flat bolt.
2 strong wrought-iron hooks.
19 yds. 1-in. mesh, 19-gauge, 24-in., wire netting.
One wrought-iron feed trough, 4-ft. long
4 lbs. mixed oil paint.

Bolts, Nuts, and Washers.—

22 6-in. x ¼-in.; 4 3½-in. x ½-in., 12 3-in. x ⅜-in.
6 5-in. x ½-in. 2 3-in. x ½-in., 22 2-in. x ⅜-in., 2 ¾-in., washers.

The cost of erecting a single pig-stye at Melbourne prices (labour and material complete) would be £16 10s.; for each additional pig-stye £14 15s.

ORCHARD NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Present indications and reports point to a prolific and profitable season. Stone fruits have set well in most districts, and apples, pears, &c., promise a fair crop, even where heavy yields were obtained last season. Frost, hail, or very heavy winds may diminish the promise, or the thrips, so fatal to the setting of Five Crown Pippin, Rome Beauty, and other late blooming varieties of apples in occasional seasons, may again be in evidence should favourable weather for the pest occur, and the fruit-grower be powerless to avert ensuing damage. These non-combatable agents are fortunately of rare occurrence, and there is nothing at present to denote danger for the season. The careful orchardist also knows the risks he may take in dealing with what are practically certain foes to his profit-earning fruits. Black spot, aphis of kinds, and codlin moth are factors that require to be dealt with in no uncertain manner, and the latter, especially, is often misunderstood and levies a heavy toll on the crop.

As codlin moth is the most common pest of apples and pears in all parts of the State, and one of the most difficult to deal with, a deal has been written from time to time respecting the means and measures likely to subdue it. The life history has been described often, the insect is now well known by most orchardists, and the spray washes calculated to destroy it—either home-made or proprietary—have been tested and the results made public. There is no need to enter into details in some particulars of the treatment; in others much has yet to be explained for the benefit of beginners and a few others. Shortly, the programme is:—The destruction of the hibernating insects, *i.e.*, the grubs or caterpillars, hiding in the trees, fruit cases, packing, and store-houses, &c.; spraying the trees carefully with an arsenical preparation before the fruit is attacked by the insects that survive the "spring cleaning"; the trapping, by means of bands applied to the trees, of the few that may escape arsenical poisoning; the destruction of "grub" infested fruit; and by again spraying to poison any that may attack the fruit during summer.

The most important of the points mentioned are the form of arsenical wash and its application. Home-made arsenites are often unsafe, on account of the damage that may be caused by their use to the foliage, the fruit, or even young woody tissue. Many cases have occurred where the entire crop of fruit and the whole of the leaves have been destroyed by one caustic application. At one time, Paris green was the standard mixture, now the most effective and safest preparation is arsenate of lead. Arsenate of lead is prepared from arsenate of soda and acetate of lead in certain proportions, but the chemical problems involved in its manufacture are beyond an ordinary orchardist, and it is safer and wiser to purchase the material ready for use. Arsenate of lead is a chemical combination and not a secret preparation. A sample or brand may be chemically pure and yet inferior to another sample by reason of containing an excessive amount of moisture. A fair sample that will be effective when used at the rate of two pounds to fifty gallons of water should not contain moisture in excess of 46 per cent., and should contain about 19.5 per cent. of arsenous acid. Many brands are now on sale, including several prepared in Victoria. There appears to be no reason whatever why a locally prepared brand should not be as safe and effective as one prepared in America or elsewhere, and it is very likely that any doubt in that direction will be

settled during the coming season. At present it is only fair to state that Swift's arsenate of lead, prepared by the Merrimac Chemical Company, Mass., U.S.A., has proved to be, by far, the best preparation used for the purpose. It is safe, very effective, and easy of application, and may now be considered as the standard preparation against all chewing insects.

Respecting the application—which includes manner, time or period, and frequency—variable opinions are expressed by fruit-growers and others. There is no doubt that poor results will follow the application of Swift's arsenate of lead or any other preparation, if reasonable care and judgment are not employed. The first consideration is making the paste into a thin wash so that, when the required quantity of water is added, the mixture is of equal value throughout. The aim in spraying should be to cover the fruit with the wash so that, when the moisture evaporates, the poisonous substance remains where there is any liability to attack and that is, in short, anywhere on the whole surface of the fruit.

The codlin moth is popularly supposed to develop into the perfect egg-laying stage about the blossoming period and to lay its eggs in the calyx or eye of the young fruit, or, as some few people assert, in the blossoms. The practice of people holding this belief is to try and fill the eye of the fruit with the poison, whatever it may be, and to depend largely, if not altogether, on the one application. The facts are that few eggs are laid during the blooming time—except in the case of late-flowering varieties that are not specially attacked in the eye on account of being in flower when the moths are plentiful—and that the majority of the eggs, at least, are not laid in the calyx, or even near it. Also, the calyx is often closed, and the fruit fairly large, before any evidence of codlin moth is present and the first trace is the egg *on the fruit* and the young insect attacking from the side. Many, if not all, of the supposed attacks from the calyx end of the fruit will be found on examination to be made from outside the calyx and underneath its lobes, and not from the interior of the cavity.

It is positive waste to spray apples and pears when in blossom; it is erring, possibly on the side of safety, to spray very thoroughly before the calyx closes. But it is absolutely necessary, in the writer's opinion, to spray very carefully when the first eggs are seen and to repeat sprayings periodically as fruits are swelling, after very heavy rains, or when, by any reason, whatever, there is an untreated surface of the fruit exposed. The codlin moth lays from about the end of October until the end of December, where single brooded; where a second generation develops, eggs are laid at all times, more or less, during spring and summer.

Other pests to deal with this month are aphides, especially on peaches, and root borer. Swift's arsenate of lead destroyed quantities of root borer beetles at Doncaster last year, and may prove to be the only treatment required for this terrible foe to the orchardist. Peaches must be cleaned from aphis or the trees will suffer and the crop be ruined. Tobacco and soap are remedies, both or either. A solution that will kill must be determined by the operator.

DESCRIPTION OF APPLE.

French Crab.

J. Cronin, Principal, School of Horticulture, Burnley.

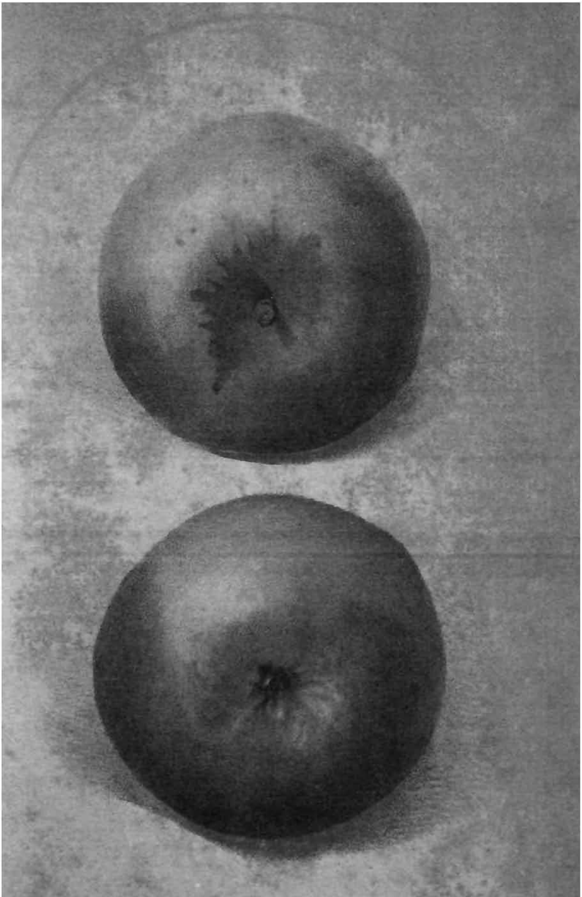
Fruit medium size, roundish, slightly ridged at the crown. Skin smooth and shining, green, strewed with small russet dots, flushed with red where exposed to the sun. Eye small and closed, set in a shallow basin. Stalk short, inserted in a round cavity. Flesh greenish white, finely grained, crisp and juicy, pleasantly acid. Quality first-class for culinary purposes.

The French Crab is the longest-keeping cooking apple, it being possible to obtain it in good condition until Christmas when the new season's early varieties are maturing. Some years back it was a popular variety, and was largely planted in districts near Melbourne, but is rarely seen now in modern commercial orchards. A few growers still maintain that it is worthy of a place, but the consensus of opinion is that it is not as profitable as other kinds. The principal objection of many growers is the rotting of the fruit, even while still attached to the tree. In some soils and districts quite a large proportion of the fruit is affected at times. The fruit sold in Melbourne in the winter months is principally produced in Tasmania, where French Crab is largely grown.

The tree is vigorous and hardy and succeeds in any soil suitable for apple growing in the Southern districts of the State. Many large specimens may yet be seen in old-established orchards in various parts of Victoria, but the greater part of the trees planted years ago have been removed, or have been cut down and re-grafted. Many of the old trees bear abundant evidence of the liability of this variety to the attacks of woolly aphis, and on that account alone it has frequently been discarded.

French Crab is identical with the variety grown in England as Winter Greening. The latter name is undoubtedly the most appropriate and descriptive and, according to Hogg, is the original name.

Allowing for the possibility of cheaply and easily combating any diseases that may affect it, French Crab is a fair variety, but there are numerous kinds likely to be more profitable.



FRENCH CRAB.

SILOS AND SILAGE.

A. S. Kenyon, C.E., Engineer for Agriculture.

For the last three years farmers making and using silage have given their experiences in the *Journal*. They may be found in the numbers for December, 1906; August, 1907; and December, 1908. Since then, some very interesting and valuable communications have been received and it is now proposed to publish a further instalment.

Mr. Rout, Willsmere Park, Kew, writes:—

"In the autumn I filled it about three parts full of maize silage, and have fed to 30 cows, and still have 3 feet of silage in it. I started to feed straight after filling, and for 6 feet down there was about 6 inches damaged round the sides, but we carted it out into the paddock for the dry stock, and they ate every bit of it. After that the waste was practically nil. There were a few white patches through it, but the cows ate it greedily. I did not weight it but I think if it was weighted with sand it would be a big improvement. I intend trying it next time I fill my silo. *I am well pleased with it. I had to make a door at the top of the elevator* box and another at the bottom underneath; when the chain gets a bit slack it comes off the sprocket wheel and it was very awkward getting it on until I made the door."

It is necessary when the chain is new to keep taking up the slack with the adjustable bearings, and when possible taking a link out. This will prevent the jumping referred to. The elevator lid is now put on in sections so that it may be lifted off at any particular place.

Mr. M. Kavanagh, Mooroopna, in July last, wrote giving his experience:—

"The silo was filled with amber cane. We have been feeding 30 milkers and about two-thirds of the 100 tons is now used. Night and morning we give 30 lbs. to each cow. We do not find much increase in milk, but the cows are in good condition. *There have been mouldy patches all the way down the sides.* We had two men trampling the chaff during the three days we were filling the silo. I think the air gets in at the sides. We used about 2 tons of posts for weighting, and had only about 1 cwt. of damaged silage on top. I am going to fill the silo with chaffed oats next season. I feel sure every farmer should have one or more silos."

Mr. C. E. Taylor, Tongala, was not successful and explains his methods:—

"I put 56 one-horse loads in the first silo and 47 in the other—10 acres of Cape barley, 1 acre of rye, and the rest wheat and wild oats. The barley was a first-class crop. I was guided by your instructions in the *Journal*. I started in the milky stage, just when you can squeeze the milk out with your fingers and it was cut mostly in the mornings. We put about 5 feet per day into the silo. It took 12½ days to fill the two; then we soaked some old bags in the water channel close by and laid them over the top, and put 600 bricks on top of each silo. We have emptied *the last one we filled. The wild oats was on top of this one. The other silo is* full, and our cows are that saucy they will not eat the silage. I started in February, and they ate it well till the grass got good, and we finished about the end of June. It got worse all the way down. I put the last of it into the pigsties, as the cows would not touch it. We did not weight it. We fed it in boxes in the bails. We milk about 35 cows. Some cows will eat twice as much as others. One of us trampled each load, while the others sharpened the knives. I do not think you will ever make as good silage in overground silos as in a good brick pit in these hot districts, where the glass is sometimes over 100 degrees. We had far too much waste all round the sides, and patches also. It was caked so that we had to break it up with a fork. As we got down the cows ate less, and it spoilt more the less we took out. I do not think barley or rye is the best for the purpose. I will fill the next one with Algerian oats, and will cut it greener, and not fill it so quickly; if no better I will give it best. I do not think we got 100 tons in them; 103 one-horse loads would not be anything like 200 tons. I think the other silo should be *a little better than the one we finished, because it was filled first, and it is on the* south side of the other, so it would keep the sun off it a bit."

It is evident that the air was not sufficiently expelled in this case, probably the over-ripe stage of the crop contributed to this. There is

nothing in the heat idea, as first-class silage has been made in iron silos in hotter places than Tongala, while bad silage has been made in pits in all localities.

Messrs. Hargreaves and Sons, Mandurang, found no difficulty:—

"The material used in filling was maize. It has given every satisfaction, being a splendid sample of silage. It was half full. We started to use it on the 15th of May, and are still using it. We have been feeding 27 cows on it all the time. We will fill the silo to the top in the spring with oats, and, later on, in the autumn with Japanese millet. We have tried this fodder, and consider it better than maize, as it is much easier to handle. When the maize grows very high, as it does with us, it is bad to cut with the binder. There was very little mouldy silage around the sides. We put straw on the top, and weighted it with about 2 tons of slabs, but consider it unnecessary. About 6 inches on the top was mouldy. In conclusion, we can say without fear of contradiction that it is the best method obtainable of conserving and feeding fodder, other than lucerne. We have 10 acres of this fodder which we intend to make in future entirely into hay. This, fed in connexion with the silage and their daily pasture and a little bran, will bring us as near to a balanced ration as it is possible to get."

Although lucerne makes good silage, if care be taken, there does not seem to be the same profit, as compared with making it into hay, as there is with the other fodders. Generally speaking, it is advisable to make lucerne into hay to be used as a protein provider with silage made from the less rich crops.

Mr. D. H. Coghill, Tatong, is interesting:—

"The silo was immediately used for a crop of sorghum (about 4½ acres) with a little maize. Owing to an unfortunate delay in starting to build it, the frosts cut the sap out of the leaves. To my surprise, it has turned out far better than I expected. The cows are really greedy for it. In my opinion, had the sap been there, it would have made a splendid sample. I find that the cows are able to digest almost all the hard seeds; so opposite to the scandalous waste in feeding green. My opinion has always been that green maize or sorghum, chaffed, is preferable, in that there is no waste, it is easier for the cow, and there is no damage to the pasture through being trampled over while feeding. This I clearly proved by feeding it just chaffed during a spell of very wet weather, which delayed the filling, and in which we would have been unable to either cut or cart it out of the paddock. I was feeding 45, down to 28 cows, since May, and now feed 28 on about 15 lbs. of silage with 10 lbs. of oaten hay chaff scalded.

"*Re* struts and posts. In almost all ground I would advise discarding them, the same as I did. Just specify a 6-ft. redgum or grey box fencing post, to be 6 inches x 4 inches small end with a large butt, say 12 inches x 6 inches or better still 16 inches x 7 inches. In the centre of the bays I put a short post, and bolted to bottom hoops. A leather belt elevator I had was a failure, owing to the sap making the leather wet and causing it to stretch and slip."

Mr. E. J. Savige writes from Narracan, a district where considerable trouble has been experienced in making good silage from oats:—

"I filled my silo three-quarters full last November with Algerian oats. It was very dry here then, so I commenced feeding right away, not putting any weight on the silage at all. There was a lot of waste—about 3 tons. It was bad all round the sides, and one patch I struck about half-way down, and extending to the bottom. It was a very dark colour, and appeared to be burnt. The cows would not eat it unless it was well mixed with the good stuff. I did not expect my stuff to turn out well last year on account of having such a lot of bother with the elevator and oil engine. I was fourteen days getting it in, so you can see the silo did not have a fair trial. I fed twenty cows for about fourteen weeks, giving each cow 26 lbs. per day, and they kept up in their milk very well. In fact, my returns are the best I have had during the nine years of my dairying experience. I hope to have less waste this year. I put in about 9 tons of maize after I had finished the oats. I find the oats a long way before the maize for milk producing. I think if I had filled the silo within three days and then put on about 3 tons of earth I would have had very little waste."

Mr. W. Rendell, Picola, relates:—

"We filled it three-parts full with an oat crop that we could see would be a failure through the dry season we were having. (The Goulburn Valley did not get

the grand rain last October which benefited such a large portion of Victoria.) The oat crop was only a foot high, so it was very short after it was cut. We got a start filling it on 2nd November, and we were a week getting it three-parts full. I am sure we could do it much quicker if we had good stuff to work with. We had no straw for a top layer. In weighting it we used heavy fencing posts, as many as could be laid on the surface. We started using the silage on 4th December, feeding 15 cows, also young stock, and we found the pigs were fond of it as well. The stock that we fed the silage to kept in good condition, and the cows kept the flow of milk up fairly well. I should think that a 100-ton silo filled would easily keep 30 cows in feed for six months. I estimated what we put in our silo would have made 10 tons of hay, and when it had properly settled down we must have had 70 or 80 tons of silage. We cut it with a No. 1 Buncle chaffcutter, 12-in. mouth, and we used a strong horseworks made by T. Robinson and Co., with two horses abreast to work it. The horses were quite able to work it. The elevator gave us some trouble, which we will no doubt be able to cure next time. We kept the outer edges of the silage well trampled while filling, and we found when using it about 6 inches of mouldy stuff. I might mention an easy way of getting the posts up to the top of the silo. We hung a single block on the ridge pole and another one to the side of the silo 3 feet from the ground; then we reeved a rope through the lower block up to the one above and down to the posts. We then fastened the posts so as they would go up horizontally, using a horse for pulling them up. By nailing a piece of 3 x 2 to the studs where the posts are landed you can prevent the iron from getting damaged. I am very pleased with the way the silage turned out, and think it is a splendid food for milking cows, and I think that if the stuff you put in the silo were made into hay it would only last half the time that the same amount would if made into silage."

Mr. John F. Fortune, Yundool, has not had good results though well satisfied. It appears from the notes that the crops were cut rather on the dry side. The addition of some water and salt would have been an improvement:—

"No. 1 silo was filled in November with Algerian oats, grain in doughy stage, seed just firm. Silo filled in two days. One man only was in silo trampling the whole time; I was in occasionally. The stuff was trampled only around the sides but it was well done, the man keeping his back to the iron the whole time and working round and round. No weight was applied. I began feeding this silage the first week in December of same year (about a fortnight after filling) to 23 cows and 13 head of young stock. Ration: 20 lbs. silage, 3 lbs. wheaten straw chaff, 1½ lbs. bran, 1½ lbs. Algerian oats (whole) twice a day. Daily ration approximately 50 lbs. a day. The result was that the cattle looked splendid and milked well, milking cows averaging £1 per head per month. From 8 inches to 1 foot of mouldy stuff on top was all eaten up after being thrown out in the paddock; 8 or 9 inches of mould all around the sides from top to bottom of the silo was mixed with the remainder of silage and eaten each day without any waste. There were no mouldy patches in the body of the stuff, only at sides where trampled.

"No. 2 silo was filled directly after No. 1 was finished. I cut a chain wide around all my grain crops, both wheat and oats, as an insurance against fire. The oats was first filled into the silo, and is therefore at the bottom. It took two days to fill the silo. I had two men trampling the whole time, and myself occasionally. No weights were applied, but when filled the top was well wetted, covered with old bags and bags saturated with water. I began feeding this silage on 26th March, 1909. About 15 or 18 inches on top was very mouldy and tightly caked. The stock would not eat any of the mouldy stuff. The silage was much darker, a little hotter, and smelt and tasted much more sour. The cows ate it well, and showed a slight increase in milk. About 14 to 16 inches all around the sides was mouldy, much worse than in No. 1 silo, and was very tightly caked. The cows left all mouldy silage in their feeders. At the present time I have not got down to the oaten silage. From past experience, I think that, comparatively speaking, oats make sweet silage and wheat sour silage, and that the less trampling in filling, the less mould. This, of course, is contrary to Departmental teaching, but, nevertheless, that is my opinion."

Mr. Thos. Douglas, Smythe's-road, is pithy:—

About 2 acres of maize almost filled the silo. The silage was first class quality, the only loss being about 6 inches on top, while the sides were quite good. There

certainly was a slight patch mouldy, but this was all eaten by the cows; and our cows are somewhat particular. We covered the maize well with hay chaff and weighted it with about 20 rails.

Mr. Muntz, Yielima, writes :—

"We filled the silo with oats having very little grain, the crop being too heavy to fill. The results were most satisfactory. There was 6 inches discoloured right round the sides, but the stock ate it greedily. Weighting was done by $3\frac{1}{2}$ tons of split posts over bags. The temperature was kept at about 130 deg. by thermometer, and the silage opened out splendidly."

Messrs. E. and A. Cameron, Yannathan, make some suggestions :—

"We filled with chaffed maize about 26 feet in depth. Green maize only was used for filling. Silage was fed to cows in milk and mixed with oaten hay chaff. Chaff is carried on the elevator into silo. We cut chaff about once a week, and mix about a day's supply at a time in silo, which we throw out at port holes down a very primitive shoot, which was hurriedly constructed, into a large trough, where it receives another mixing before going into feed truck. We do not weigh out the rations for cows, but have weighed what would be a feed, and find that about 18 lbs. for one feed, or 36 lbs. for two feeds, results satisfactorily.

"About 5 inches on surface was more or less mouldy, and on the top outside edge there was, from approximately level with the good stuff, a piece towards the outside all round the iron wall about 8 inches deep and 8 to 10 inches wide on surface. *Re* weighting, we spread a layer of dry chaff on top, then $\frac{1}{2}$-inch boards with a few blocks of wood on top. We would consider there was not more than 4 cwt. of all sorts on for weighting. We consider that a shoot made to fit port holes should go with each silo, and it should be in sections for the various heights for emptying silage at port holes to avoid the necessity of having to climb to the port hole above the one in use. The top portion should be made to work on a hinge to allow of ingress or egress like the lid of a box, each port hole to have permanent eye bolts or fixture to allow of shoot being removed easily, as the shoot would require fastening at each port hole. It would also require stays, iron or steel bars, to hold it out from sides of silo and support. Provision could then be made for a means of fixing the doors of port holes when not in use and silo was either empty or being filled. We find that unless port holes are well closed when cutting either green maize or chaff a great draught causes a lot of waste, some of the cut stuff being blown out of silo altogether and thus lost."

Mr. George Little, Ballamure, is pleased with the results in a wet winter :—

"I had one man inside spreading and two boys walking round the side. I weighted it with bags of clay, about 1 cwt. in each bag, which were pulled up with block and tackle. I put $4\frac{1}{2}$ tons on it. I opened it in three weeks and gave my cows (20) one feed a day. I can hardly say anything with regard to results of feeding as the cows were on green oats, and the feed of silage with the oats kept them in splendid order. I had no sickness amongst them as is usual when fed on green oats during winter. When it was too wet to put them on the oats I fed them three times a day on silage, and it kept them up in milk and also in good condition, otherwise they would have been almost dry as the rain was so continuous. As regards waste there was practically none. When opened there was no waste on the top. There may have been 2 or 3 inches of mouldy stuff round the sides, but when mixed up it was all readily eaten. I am, indeed, very pleased with the silo, and hope to have another later on. I strongly recommend them."

Mr. Harley, Kilcunda, had rather varied results :—

In December I put in 45 tons of oats, nearly ripe. Some of it was lying in the paddock for several days and got very dry. My neighbours who saw it predicted failure, but it turned out first class, with no mouldy patches—only about 5 inches around the edges, but the cattle ate it all greedily although in good grass paddocks. It had a very malty smell, and in damp weather the bags felt very sticky as of sugar. I must say I was very pleased with it. I was rather late in starting to feed it, viz., end of January. It should start in my district not later than Christmas, for that is the time the cows commence to go off. My cheques at the factory had been falling every fortnight, but when I started to feed they stopped falling, and although the silage did not increase them, they—the cheques

—remained stationary for seven fortnightly pays. I am quite convinced, if I had started to feed before Christmas, they would have remained at the flush. I hope to be able to feed by that time this season. With my maize silage I am not so pleased. The cows do not seem so fond of it, and it does not smell so sweet, having more a smell of brewed hops. I have some which is a mixture of green oats and maize, but the cows do not like it at all. I put it down to the oats being too green when cut. The cows prefer the maize by itself. I think a mistake I made with my maize was that I let it get too old, owing to waiting for it to partly ripen the cobs, for the stems are very hard, although fairly sappy. Next season I will try it just as the cobs are formed. Taking it on the whole, I am very pleased with the silo, and intend to go in for more of a mixture of grain and peas, beans, &c."

Messrs. Savin Bros., Macarthur, record a failure. There is very little doubt that the crop in the second silo was cut too ripe. Water should have been added.

"One of our silos turned out splendidly, but the other was a complete failure. It was burnt from top to bottom. It was filled up within 3 feet of the top. The cause of it we do not know, but we think the stuff was a little too dry. The good silage the cows ate well and milked well. We gave them two cart loads night and morning to 40 cows. Each cow gave about $1\frac{1}{2}$ gallons per day, which, we think, was very good for that time of the year. There was very little loss around the sides. We filled the silo with oats, and used no weights for weighting it. We think the older the silo gets the more air tight it gets. Our first silo cured better this year than it did the first year."

Mr. Glasson, Kiewa, made a rather unusual mixture with success:—

"I had about 10 acres of amber cane, but fed about half of it to the cows before the silo was finished, and it did not grow again after it was once cut. I only had about 30 tons to put in the silo, and I mixed about five good dray loads of pea hay with the cane, using plenty of water to damp it as it fell in the silo. I fed it to 20 cows, and it lasted three months. They liked it very much, leaving good oaten hay chaff for the silage. There was no loss or damaged stuff around the sides or mouldy patches worth speaking of."

Mr. Alex. MacKenzie, C.E., Engineer to the Geelong Harbor Trust, describes its concrete silos and the results:—

"The two reinforced concrete silos erected at Sparrovale Irrigation Farm are each 35 feet in height and 20 feet internal diameter. The cost of each silo was £210. The reinforcement consisted of $\frac{1}{2}$-in. diameter rods placed vertically having 12-in. pitch; and $\frac{3}{8}$-in. and $\frac{1}{4}$-in. diameter rods placed horizontally, the pitch varying from 4 inches to $2\frac{1}{2}$ inches. The concrete consists of sand and bluestone screenings in the following proportions:—

1 cask of cement ...	=	$4\frac{1}{2}$ cubic feet
$\frac{3}{4}$-in. bluestone screenings	=	15·075 cubic feet
Sand	=	9·486 cubic feet

"Tests made showed that these proportions, when mixed wet and well rammed, made 18 cubic feet of concrete. The concrete in the walls was 4 inches thick at the bottom and 3 inches thick at the top, the floor having 6 inches of concrete, and was reinforced with $\frac{1}{2}$-in. diameter rods, 9-in. pitch in both directions. On No. 1 silo the interior and exterior surfaces of the concrete were left as they were stripped from the moulds, no rendering or cement washing being done. This did not prove satisfactory, and the second silo was washed on the inside with neat cement mixed with water.

"Maize silage was filled into the first silo 29 days after the construction was completed, and in the case of the second silo 23 days after completion. During the filling of the first silo, which extended over a period of two weeks, it was found that the juice from the silage was percolating through the concrete. To prevent this taking place in the second silo the interior surface of the walls was given two coats of neat cement and water, which effectually prevented any percolation, but as this silo was only half filled the efficiency of the cement wash was not fully tested. Prior to filling, the interior surface of each silo was well coated with lime wash. The filling of the first silo was completed on 18th May, and the silo was opened on 9th July. The top of silage was covered with 2

inches of damp straw chaff and straw. Between the time of completing, filling, and opening this silo a settlement in the silage of 7 feet had taken place. There was no loss of silage, either on the top, bottom, or sides. Of maize, 398 single loads were chaffed and placed into No. 1 silo by means of a conveyor. The number of tons of silage taken out of this silo was 234. The actual weight would have been considerably more if this silo had been perfectly tight and had not allowed most of the liquid to escape. The returns kept show that, in the top 7 feet of silage, the actual weight taken out was at the rate of 4 tons to the foot. The second 7 feet, at 8 tons per foot; the third 7 feet, at 9 tons per foot; and the bottom 7 feet, 12 tons per foot.

"When the first silo was empty it was found that the interior surface had suffered damage to a height of 22 feet from the bottom, the concrete being soft in patches, and more particularly at the points of union between the courses of concrete which were 4 ft. 3 in. apart. Apparently there was an imperfect bond between the various section of concrete which was erected between moulds which were 4 ft. 3 in. in height. It is suggested that the deterioration of the concrete was due to the corrosive action of the acids in the silage juices, which are more active on a rough or porous surface than they are on a smooth surface. This is possibly the correct cause of the deterioration, as the bottom of the first silo, which was smooth, was not affected, with the exception of the circumferential joint between the bottom and walls; also the second silo which was treated with a cement wash was found to be in good order. To correct the defects in the first silo the soft patches were raked out and the interior surface rendered with a mixture of one of cement to two of sand to a height of 22 feet. When the silos are filled this season no further trouble is anticipated."

Mr. J. Alexander, Toolamba West, is satisfied:—

"We put the green crop of maize into silo at the end of February. We only had sufficient to half fill the silo, so cut some straw and put on top, and then about 15 inches of earth over that. Silo was opened on 15th May. There was a little waste (a few inches) on top, and for the first few feet a few inches mouldy around sides. After getting down a few feet silage was good all through. There were no bad patches through the silage. We fed to dairy cows until the finish, 20th July, and the amount of milk increased greatly while using it. The only improvement I could suggest is that the lining might have a longer lap, so that clouts need not be put in line but might be zig-zagged, as they have split hoops right round."

SILO CONSTRUCTION.

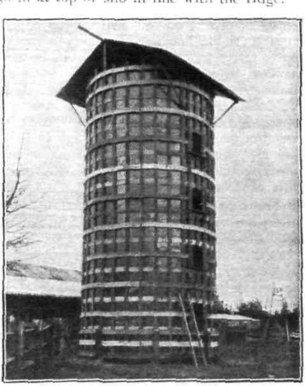
As there have been some slight alterations since the last publication of drawings and specifications for a wood and iron silo (October, 1907, *Journal*), particularly in regard to the elevator, fresh drawings and particulars are published herewith. These are, of course, not final. Many suggestions from correspondents have been adopted and more will be welcomed. The use of a preservative coating of tar or similar compounds on the inner face of the iron lining has been abandoned as the action of lime is antagonistic to such substances. As the lime wash is essential, even more care has consequently to be employed in seeing that it is well and thickly put on. It is advisable to limewash as the silo is emptied to preserve the iron before refilling takes place. Successful silage making depends upon the faithful observance of the details of the directions for filling, and successful construction is also a question of careful work. None of the points, upon which stress is laid, are unimportant. They are all the fruits of experience and have been carefully thought out and tested before being recommended.

SPECIFICATIONS FOR THE CONSTRUCTION OF A SILO 14 FT. 8 IN. INSIDE DIAMETER AND 21 FT. HIGH. (60-TON SILO).

All the materials used are to be of approved quality and the best of their kind. The timber is to be specially free from knots and gum veins. The foundation posts and the iron sheets (one side only) are to be tarred before commencing erection.

THE FOUNDATION.—Roughly level site for a diameter of 16 feet, making provision if on slope for drains to carry off any flow of water. Prepare eight foundation posts of 6-in. x 4-in. red-gum according to the accompanying drawing, having 6-ft. post, 3-ft. sole, and 4-ft. strut. Halve the post and sole together edgeways and secure with 6½-in. x ½-in. bolt. Halve the strut edgeways on to the post and sole and secure with 9½-in. x ½-in. bolts. Round timber roughly dressed may be substituted for the red-gum, but care must be taken to have the inner face dressed truly. In this case it is probable that longer bolts will be required. Fix a peg in the centre of the site selected for silo, and describe a circle with a trammel 7 ft. 8 in. in length. Sink posts 2 ft. 9 in. in the ground so that the inside face of each post is true to the end of the trammel. Keep tops of posts to one level and faces truly perpendicular. Well ram the earth put back. From the centre line of face of post to the same line in the next post is 5 ft. 10½ in. measured straight. Put posts in to suit line of roof ridge, which should suit position of chaff or silage cutter and elevator. The elevator should go in at top of silo in line with the ridge.

THE TREBLE HOOPS.—Nail three of the 6-in. x ½-in. boards to the inside of the posts, carefully springing the first of them to the circle of the trammel, off which half-an-inch, the thickness of the board, must first be cut. Make butt joints and let each successive hoop break joints. Keep the bottom edge of the first treble hoop 34½ inches from the top of the post, which will leave it 4½ inches above the surface of the ground. A similar treble hoop is fixed so that its upper edge is 1½ inches below the top of the post. In fixing the upper treble hoop, the trammel, to which a lengthening piece has been nailed, should be used on the slant to insure a correct circle. These two treble hoops are used to fix studs in upright position



A TYPICAL 100-TON SILO.

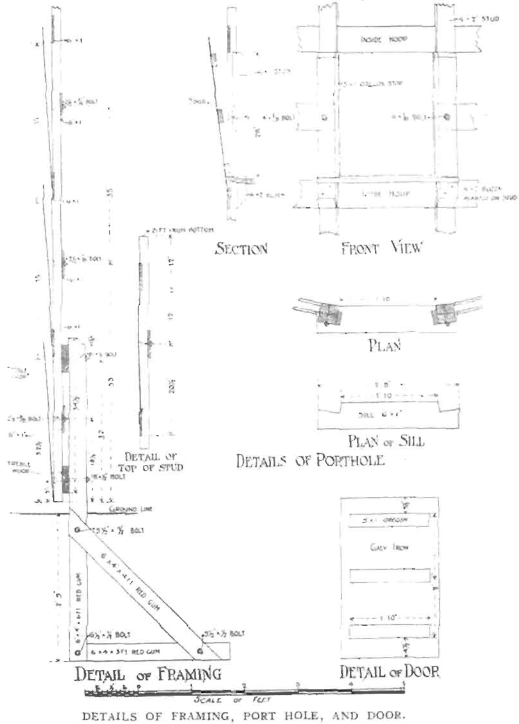
THE STUDS AND SINGLE HOOPS.—First bore and check studs as shown in drawing. The 32 studs (6/24-ft. and 26/21-ft.—4-in. x 2-in. hardwood) are to be bored for bolts and countersunk ½ inch deep, 1 inch diameter clear, for heads of bolts. The centre of first hole is to be 5 inches from the bottom, the second 18½ inches, the third 32 inches, the fourth 53 inches and thence at intervals of 35 inches, the ninth and last being at 19 feet. The first and third holes are to be bored for ½-in. bolts, and all others for ⅜-in. All studs are to be checked out 6 inches wide and ½ inch deep on the same side as the countersinking; from bottom of stud to bottom of first check 32½ inches; and from bottom of first to bottom of second 35 inches, and so on to the sixth check 17 ft. 3½ in. from the bottom. The seventh and last check is 20 feet exactly from the bottom of the stud.

Before setting up studs decide upon position of port holes; these to the number of three, if the first is in the second row of iron, or four if the first is at ground level, should be vertically above one another, and should be so located as to make the transport of silage to the feeding place as easy as possible. The first stud to be erected should form one side of the row of port holes. The port holes need not be in line with ridge. They may be at any part of the silo. The studs are fixed to the hoops on the flat, every fourth one coming opposite a foundation post, to which they are bolted with two 8-in. x ½-in. bolts passing right through the studs, treble hoops and posts. The intermediate studs are bolted to the treble hoops with 3½-in. x ⅜-in. bolts. The bolts are all inserted from the inside, keeping the nuts on the outside for access when screwing up later on. The spaces between the studs, except at the port holes, should be 13⅛ inches clear measured between the inside edges of the studs, but are generally a little more depending upon the actual dimensions of the studs. To allow for this, cut a template 13⅜ inches long, using it as a gauge to correctly space the studs. Drive a 4-in. nail 3 inches above the centre of the third hole from the bottom of the stud. When erecting stud, let it rest on this nail on top edge of upper treble hoop; then nail stud to treble hoops with one 3-in. nail at each. These will hold stud until ready to bore for bolts. It is well to try every fourth stud with a sheet of iron to see that lap comes correctly. Following these directions, the whole 32 studs are erected, the last, however, being put up 22 inches distant from the first instead of 13⅛ inches; this is to leave space for the port holes. The distance between the last stud and the last but one will be less than 13⅛ inches. For the purposes of the roof, put two 24-ft. studs opposite one another and attached to foundation posts. Place the four other 24-ft. studs at the third stud position each side of these two.

The next operation is the putting on of the single hoops. These are alternately on the outside and inside of the studs, the inside hoops taking the horizontal lap of the sheets of iron forming the lining and falling into the checks made as already described. First put on a single hoop between the two treble hoops. Next put on the others, carefully adhering to the following directions:—Mark the outside hoops for positions of studs before putting up, by bending them round on top of the upper treble hoop and against the outer faces of the studs. The hoops should be fixed to the same studs as marked. This need not be done for each hoop, every second one will be sufficient. Unless this is done carefully, the silo will most likely have different diameters at different points and trouble will ensue when putting on the lining. The outside hoops should lap over so as to cross two adjacent studs. They are secured at each stud with 2½-in. x ⅜-in. bolts and at laps with 3-in. x ⅜-in. at first stud of the lap and 3½-in. x ⅜-in. at the last one, there being a plate washer 3-in. x 1-in. x $\frac{5}{16}$-in., with ⅜-in. hole in centre at the end bolt. The inside hoops are bolted on a stud and are fastened to the studs with two 2-in. nails to each stud. Care should be taken not to have the joints vertically above one another. Nail short pieces of 6-in. x ½-in. for the width of two studs opposite to the inner hoops; these will serve as a ladder for access to the top and the port holes.

THE LINING.—Six feet by three feet 24 gauge galvanized flat iron is used, tarred on one side as already directed. The tarred side is kept on the outside against the studs. If the studs and hoops have been erected as described, the sheets will have a lap of 3 inches vertically on the studs and 1 inch horizontally on the hoops. Carefully press the sheets out to

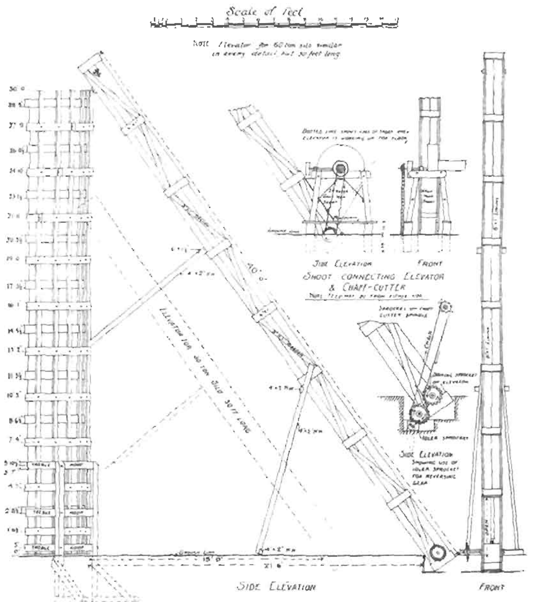
the line of the circle before nailing, and start at the centre stud, working out to the side studs. This will make the iron set better. Tack with 1¼-in. clout tacks on the studs, 3 inches apart at the laps and 6 inches at the other studs. Tack with ¾ in. clouts (two between each stud) to hoops at horizontal laps, putting clouts ¼ inch up and down alternately



DETAILS OF FRAMING, PORT HOLE, AND DOOR.

to avoid splitting hoop. The upper sheet in each lap is put outside the lower to keep the weather out and prevent rain working in. Consequently, this work must be started from the top of silo. Drive two tacks in the hoop below the sheet at its ends to rest the iron on while tacking. These tacks to be drawn when sheet is fixed.

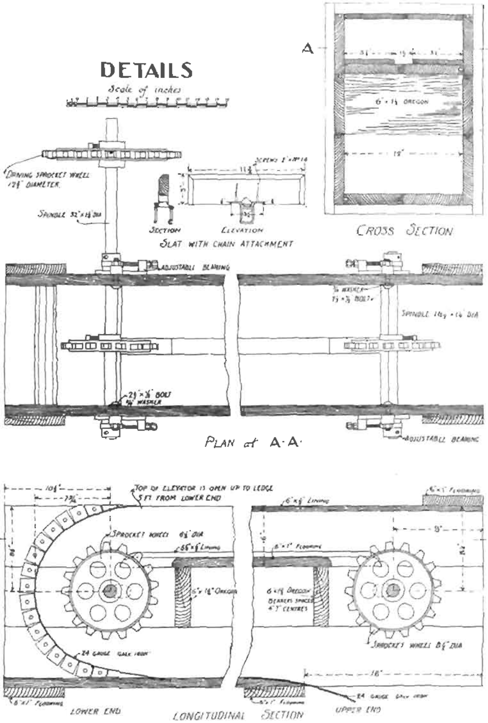
THE ROOF.—Fix two purlins for ridge 20 feet long to the centre 24-ft. roof studs, the top of studs being checked 1 inch on each edge for purlins, and purlins bolted to studs with 6½-in. x ⅜-in. bolts, one to each stud. These purlins to project in order to attach block and tackle. Secure in a similar manner, with 5½-in. x ⅜-in. bolts, purlins to the third studs each side of ridge studs, which are 24 feet high as directed, and bottom purlins to ordinary length studs—the sixth on each side of ridge studs. The centre purlins are fixed to suit the pitch given by the ridge



ELEVATOR FOR 100-TON SILO.

studs and the excess length cut off. Cover with 9-ft. sheets of 26-gauge corrugated galvanized iron, allowing a lap of one and a half corrugations, with 2½-in. spring-head nails at every third corrugation. Fix three lengths of 14-in. galvanized ridging with spring-head nails every 2 feet. Fix four 3-in. x 1-in. hardwood battens from studs to ends of bottom purlins for supports.

THE PORT HOLES.—Port holes are made in every alternate row of iron, the sill of the first being preferably at the top of the first inside hoop. The sills are made of 6-in. x 1-in. hardwood, as shown in the



DETAILS OF ELEVATOR.

drawing, fixed to the top of an inside hoop and supported on two short pieces of 4-in. x 2-in. skew nailed on to outer face of studs. The sides are formed of 4-in. x 2-in. pieces planted on studs, notched for ends of outside hoop and secured with one 4-in. x ⅜-in. bolt. The stops are

3-in. x 1-in. oregon set 1 inch forward from inside face. The doors are made from the piece of sheet iron cut for the port hole, backed with three pieces of 3-in. x 1-in. oregon, 22 inches long, to fit close in to the stops. They are held in position by the pressure of the silage.

THE ELEVATOR.—The length of the elevator will vary with the local conditions, whether the ground is sloping, whether the cutter is mounted on a stage, and so on. In general, the length necessary is about 30 feet. A box having sides made of three 6-in. x 1-in. tongued and grooved flooring boards with top and bottom floors of two similar boards, with a cover of 6-in. x ½-in. lining boards is all that is required. This cover should be fixed in 6-ft. sections to allow of easy removal should it be necessary to get at the chain. The sides and bottom floor are secured by ledges of 6-in. x 1-in. flooring about 4 ft. 6 in. apart; the sides are further strengthened with diagonal braces between ledges of 3-in. x 1-in. oregon. On the upper floor, which is 5 inches below the upper edge of box, it is advisable to nail two 6-in. x ½-in. boards cut down to 5¼ inches to form a groove for the chain to run in. This floor is supported on 6-in. x 1½-in. oregon bearers spaced about 4 ft. 6 in. apart. The ground must be excavated to a sufficient depth under the chaff-cutter to allow the end of the elevator to come directly beneath the chaff-cutter, or the cutter may be raised on a platform for this purpose or both may be done as shown in drawing. The end of elevator being put in as far as possible below the chaff-cutter, a shoot is made with pieces of sheet iron or of wood to connect the cutter, the whole being boxed in as far as possible. It is essential that this shoot should be as steep as possible to prevent the silage from packing up. The drive from the cutter will send the slats up the top or the bottom floor, according to the side fed from. Looking towards the silo, if the feed be from the right hand, the elevator will work up the bottom floor. This is the most advisable, as the throw of the cutting wheel is then assisting to run the cut stuff down into the foot of the elevator. It will, however, work satisfactorily, feeding from the other side, so that the cutter may be put where most suitable for feeding. The ground end of elevator is rounded off with galvanized sheet iron, allowing just sufficient room for the slats to move round sprocket wheel when the adjustable bearings are fully extended. The line of this iron will be described with a radius of 7¾ inches from centre of sprocket wheel. The cover of elevator is left off as far as the first ledge, about 5 feet from the ground end. The bottom floor of silo end of elevator is cut back 18 inches and provided with a galvanized iron lip; this is to prevent the slats striking against edge of bottom floor when the silage is being carried up on the top floor. The end of elevator is to project into the top of silo 21 inches. The top floor of silo is cut back from ground end 11½ inches and the silo end 10½ inches; the groove at each end is cut back a further 5 inches to allow for the working of sprocket wheel. The adjustable bearings are attached to the outside of elevator with two 2½-in. x ½-in. bolts to each bearing, a ¾-in. iron washer being placed between head of bolt and inside of elevator. The bearings for the ground end of elevator are fixed so that the centre of spindle is 8¼ inches from top of box and 10½ inches from ground end when the bearings are fully extended. The spindle should be fixed in this position when the elevator is working. The bearings for the silo end of elevator are fixed so that the centre of the spindle is 8¼ inches from top of box and 9 inches from silo end of elevator. The slats or buckets for carrying the silage are of 3-in. x 1-in. oregon chamfered on one

side, checked ¾ inch deep by 3¼ inches wide for the attachments which are fixed to slats with two 2-in. x No. 14 screws to each and with a V-shaped cut beneath attachment to allow for insertion of sprockets. The slats may be made to carry up on the top or bottom floor by using an additional 12½-in. diameter sprocket wheel as an idler secured on a 3-in. x ½-in. iron bar fixed as shown in drawing. The elevator is nailed together with 2-in. nails from the inside, the nails well punched, clinched and then punched again. Great care must be taken that nothing will project inside the elevator which may catch the slats. The elevator is supported in the centre, as shown in drawing, with a T-piece made of a 10-ft. length of 4-in. x 2-in. hardwood, checked ½ inch at top and well spiked to a piece of 6-in. x 1½-in. hardwood, and fixed at bottom end to silo.

The following is a list of material required for the 60-ton silo specified. Some of the items are slightly in excess, in order to meet contingencies:—

Red-gum, 6-in. x 4-in. ; 8 6-ft., 8 4-ft., 8 3-ft., foundation posts.
Hardwood, 4-in. x 2-in. ; 6 24-ft., 27 21-ft., 2 20-ft., 4 16-ft., studs and purlins.
Hardwood, 6-in. x 1½-in. ; 5 12-ft., scaffolding.
Hardwood, 6-in. x 1-in. ; 1 12-ft., port hole sills.
Hardwood, 6-in. x ½-in. ; 61 18-ft., hoops.
Hardwood, 3-in. x 1-in. ; 2 16-ft., supports for bottom purlins.
Oregon, 3-in. x 1-in. ; 4 15-ft., port hole doors and stops.
Galvanized iron, plain sheets, 24 gauge ; 56 72-in. x 36-in., *lining*.
Galvanized iron, corrugated sheets, 26 gauge, 16 9-ft., roof.
Galvanized iron, ridging, 26 gauge ; 3 lengths 16 in., roof.
Galvanized iron, springhead nails, 2½-in. ; 3 lbs., roof.
Wire clouts, 12 lbs. 1¼-in. ; 3 lbs. ⅞-in.
Bolts, nuts, and washers, 2 6½-in. x ⅜-in., ridge purlins and studs.
Bolts, nuts, and washers, 8 5½-in. x ⅜-in., other purlins and studs.
Bolts, nuts, and washers, 8 4-in. x ⅜-in., port holes.
Bolts, nuts, and washers, 82 3½-in. x ⅜-in., treble hoops and studs ; lapped hoops, plate washer, and stud.
Bolts, nuts, and washers, 36 3-in. x ⅜-in., lapped hoops.
Bolts, nuts, and washers, 200 2½-in. x ⅜-in., outer hoops and studs.
Bolts, nuts, and washers, 16 9½-in. x ½-in., foundation posts.
Bolts, nuts, and washers, 16 8-in. x ½-in., treble hoops and foundation posts.
Bolts, nuts, and washers, 8 6½-in. x ½-in., foundation posts.
Wire nails, 2 lbs. 4-in., 4 lbs. 3-in., 14 lbs. 2-in.
Plate washers, 24 5-in. x 1-in. x $\frac{5}{16}$-in., with ⅜-in. hole in centre.
Tar—5 gallons, with long-handled brush.

Material Required for 30-ft. Elevator.

White deal, 6-in. x 1-in. ; 18 20-ft., sides, floors, and ledges.
White deal, 6-in. x ½-in. ; 8 15-ft., cover and groove.
Oregon, 6-in. x 1½-in. ; 1 8-ft., bearers.
Oregon, 3-in. x 1-in. ; 6 10-ft., diagonal bracing.
Hardwood, 4-in. x 2-in. ; 1 10-ft., support.
Chain, 53 feet, 1 $\frac{9}{16}$-in. pitch. (No. 45 link.)
51 Oregon slats, with attachments for No. 45 link.
2 8½-in. diameter sprocket wheels, 17 teeth, with 18½-in. and 32-in. spindles, 1¼-in. diameter, for No. 45 link.
4 adjustable bearings.
1 27-teeth, 12½-in. diameter, sprocket wheel for No. 52 link.
1 10-teeth, 5-in. diameter, sprocket wheel for No. 52 link.
11-ft. chain, 1½-in. pitch. (No. 57 link.)
8 2½-in. x ½-in. bolts, nuts, and washers.
8 ¾-in. iron washers, for ¾-in. bolts.
1 *sheet of 72-in. x 36-in., 2-in. gauge iron.*

The cost may be computed from above list. At present prices of material in Melbourne it would run into £27 14s., of which £7 4s. is for the elevator. With an experienced builder, assisted by three handy men, the

whole work of erection, including construction of elevator, should be completed within four or five days. After the silo has been erected some time, and the greenness of the wood considerably lessened, the whole of the wood work, and in any case, the lower 3 feet, including both treble hoops, should be tarred or painted. The inside of the iron should be lime-washed, as it is nailed on. Supports, such as blocks of red-gum, bricks, &c., should be put under the centre stud of each bay, and it is well to put such supports under every stud except those, of course, bolted to the foundation posts. *It is a good idea to bolt with 8-in. x ½-in. bolts to centre stud* of each bay and treble hoops, a 4-ft. post of 6-in. x 4-in. red-gum, or suitable round timber, sunk 1 foot in the ground.

To raise the height of an existing silo, the new studs should be halved for a length of about 2 feet and nailed with two 4-in. nails on to the sides of existing studs. *This means that all the studs are 2 inches out* of line with the existing ones. This will allow for boring and fixing the new studs without removing anything except the roof. The hoops close to the ground must not be covered with earth; they are an essential portion of the structure, and should not be weakened by rot or white ants. The floor may be the earth levelled off, or a concrete floor may be put in.

A 100-ton silo is similar in most respects to a 60-ton, having the same diameter, but being 30 feet high. The foundation posts have a 9-ft. post instead of 6-ft., and are sunk 2 ft. 6 in. in the ground. In all other respects they are similar to the posts for a 60-ton silo. There are thirty-two 21-ft. studs, six 14-ft. and twenty-six 11-ft. The boring on the 21-ft. studs is the same as for a 60-ton silo, but have in addition a ½-in. *diameter hole 5 ft. 10½ in. from the bottom of the stud for the* third treble hoop. The checks are similar in all respects up to the sixth except that the bottom of the seventh and last check on the 21-ft. studs is 20 ft. 2½ in. from the bottom of the stud. The 14-ft. and 11-ft. studs are halved for 2 feet of the length from the bottom, and ⅜-in. diameter holes are bored and countersunk at 2 ft. 11 in., 5 ft. 10 in., and 8 ft. 9 in. from the bottom, and checked similarly to 21-ft. studs at *1 ft. 2½ in., 4 ft. 1½ in., and 7 ft. 0½ in. from bottom of studs to bottom* of checks. The 14-ft. and 11-ft. studs are nailed to the side of 21-ft. studs at the halved ends with two 4-in. nails to each stud. The last check on the 21-ft. stud should then line with the first check on the shorter studs. The 14-ft. studs take the place of the 24-ft. studs in a 60-ton silo. There are five port holes. The elevator, which is 40 feet long, is supported in two places, as shown in drawing, the bottom support being a *frame-work constructed of 4-in. x 2-in. hardwood consisting of two* 12-ft. lengths at sides, 18-in. length at top, and a 5-ft. length at bottom, all well nailed together. The top support is similar to that for a 30-ft. elevator.

The following is the additional material for a 100-ton silo:—

Red-gum, 6-in. x 4-in.: 8 9-ft. (No 6 ft. lengths required.)
Hardwood, 4-in. x 2-in.: 6 14-ft., 27 11-ft., 6 21-ft. (No 24-ft. lengths required.)
Hardwood, 6-in. x ½-in.: 30 18-ft.
Oregon, 3-in. x 1-in.: 2 15-ft.
Galvanized sheet iron, 24 72-in. x 36-in., 24 gauge.
Bolts, nuts, and washers—8 8-in. x ½-in., 24 3½-in. x ⅜-in., 70 2½-in. x ⅜-in., 4 4-in. x ⅜-in., 12 3-in. x ⅜ in.
Plate washers, 6 5-in. x 1-in. x $\frac{1}{16}$-in., with ⅜-in. hole.
Nails, 3 lbs. 4-in., 2 lbs. 2-in.
Wire clouts, 3 lbs. 1¼-in., 2 lbs. ¾ in.

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Additional Material for 40-ft. Elevator.

White deal, 6 in. x 1-in. ; 5 20-ft.
White deal, 6-in. x $\frac{1}{2}$-in. ; 8 18-ft. (No 15 ft. lengths required.)
Oregon, 6-in. x $1\frac{1}{2}$-in. ; 1 3-ft.
Oregon, 3-in. x 1 in. ; 2 15-ft.
Hardwood, 4-in. x 2-in. ; 2 12-ft., 1 7-ft.
Chain, 20-ft., 1 $\frac{9}{16}$-in pitch. (No. 45 link.)
Slats and attachments, 17, for No. 45 link.

The additional cost of the material in Melbourne would be £8 12s. 6d., of which £1 13s. 6d. is for the elevator.

Notes.

The ordinary horse-works and chaffcutter are suitable for cutting and filling silage.

The silo should be well white-washed inside with a thick wash made of lime and skim milk. This can be done each evening after filling, the silage serving as a scaffold. It is also advisable to lime-wash again when emptying.

The crop should not be cut until it has reached the proper stage of maturity.

Trample the silage as much as possible, especially round the sides, keeping the centre high.

Fill in not less than 5 feet and as much as 12 feet per day.

When filled, put on a 12-inch layer of chaffed straw well wetted, and load over whole surface with 3 to 5 tons of earth, stones, or other convenient material.

It is better to chaff the green stuff on the day that it is cut.

Keep the bottom hoop clear of earth and rubbish.

See that the bottom of each stud is supported by a brick or suitable stone.

POTATO SCAB.

Mr. J. G. Gregory, of Mildura, writes:—

"I have just seen the report of the Conference of Potato Growers and Departmental Officers, and thought you might like to hear of my experience with Potato Scab. Some ten or eleven years ago, I was growing a good many potatoes here, and unknowingly planted some scabby seed. I planted again of the scabby produce, and the crop from these was covered with scab. As seed was very expensive that year, I tried to find a remedy, and in an American work I read the report of Professor Bolley's experiments (North Dakota Station). His advice was to soak the seed for one and a half hours in a 1 in 1,000 solution of corrosive sublimate (Mercuric chloride). This I did, and changed to fresh ground.

The result was a crop of perfectly clean potatoes, and from that time as long as I continued to grow potatoes I was not afraid of scabby seed, but the land where it was infected was my trouble as I had only 10 acres. I found that after keeping potatoes out of the land for three years the scab germs were still in the ground and very much alive. About this time I read in the *Rural New Yorker* that, by ploughing in heavy crops of green-stuff and making the land slightly acid, the scab germs were apparently killed. I tried this method, and, to all intents and purposes, it was a success, for I could and did grow really clean potatoes on that same ground after I had ploughed in two heavy crops of green-stuff and allowed time for the last to thoroughly rot."

ANSWERS TO CORRESPONDENTS.

SILAGE.—D. J. H. makes several inquiries about silage-making and feeding.

Answer.—(1) A two-horse horseworks is sufficiently powerful to work a cutter and elevator, cutting and elevating 3 to 4 tons green fodder per hour. (2) A No. 2 chaffcutter of a 3-ton green fodder capacity per hour without sieve attachment will cost £17 10s. (3) The average amount of chaffed maize silage required per cow per day is from 30 to 40 lbs., according to the amount of grass available.

COLLECTING INSECTS.—A. D. wishes to know the names of some reliable works on collecting, preserving and naming of insects.

Answer.—*First Studies in Insect Life in Australia* (Gillies), 1s. 3d.; *Australian Insects* (Froggatt), 15s; *Butterflies of Victoria* (Anderson and Spry) 2 Parts, 5s.; *Destructive Insects of Victoria* (French), Parts I. to IV., 2s. 6d. each.

NON-BROODY TURKEYS.—A. K. B. states that he has experienced great difficulty in getting turkey hens to sit.

Answer.—There is nothing you can give your turkey hens that will induce them to go broody. They usually sit after laying about 18 to 21 eggs. Allow them to cover up their eggs, as they usually do, after depositing each egg in nest, and do not rob or disturb the nest in any way until they go broody naturally; then add eggs as desired.

BROKEN WIND.—S. J. H. writes:—"My pony has got a very bad cough. She coughs mostly in the evening and early morning. Last winter she was similarly affected."

Answer.—The likelihood is your pony is affected with asthma or "broken wind," in which case, beyond regulating the feed times and diminishing the bulk of food given, remedial measures will be of little avail.

BEST BREED OF DAIRY CATTLE.—T. P. asks several questions relative to the best breed of dairy cattle.

Answer.—(1) Opinions differ considerably; the majority prefer the Jersey. Purity should always be aimed at. (2) Ayrshire cattle are not liable to suffer more than other breeds in cold, wet and frosty weather. (3) The larger-framed animals require the larger ration. (4) Hereford cattle are probably the hardiest, but they are not dairy cattle.

"CORDS" ON TEATS.—E. D. writes:—"Since one of my cows calved some three weeks ago two of her teats are bad. What looks like a cord runs down each of them, both being about the size of a wax match. The milk has not been affected, but only small quantities come from the teats concerned at each pull."

Answer.—The cow was probably not dried off properly at end of last milking period, with the result that a stringy clot became deposited in the milk ducts, in which case the injection at intervals of a couple of days of a weak solution of carbonate of soda (1 part to 100 of water) may assist in breaking down the cord. It may be, however, that what seems a cord is really a thickening of the wall of the milk duct, caused by a sub-acute inflammation of long standing.

MAMMARY ACTINOMYCOSIS.—P. A. states that recently he bought a cow and soon afterwards he noticed a hard lump, about the size of a pea, on one quarter of the udder. The lump disappeared and a larger one came in another quarter. It is just under the skin, is hard and movable, without any heat or pain.

Answer.—If the lumps persist, and particularly if others show themselves, it is probable the udder is affected with mammary actinomycosis—tumour-like nodules in the udder, produced by the action of a fungus identical with the ray fungus which causes the majority of cases of lumpy jaw in cattle. This affection of the udder has been recently found to be fairly common amongst cows in this State. It is incurable, and may vitiate the milk to the extent of warranting condemnation of the cow.

CALVING.—C. P. N. writes:—"I had a heifer which slipped her calf two months too early. She did not "clean," and died a week afterwards. What should be done when they do not "clean"?

Answer.—Irrigate the womb daily by injection with 1 gallon of 2 per cent. solution of lysol in warm water or solution of permanganate of potash: remove by gentle traction any traces of retained membranes, and give a drench consisting of Epsom salts 1 lb., powdered gentian 1 oz., ginger ½ oz., in 1½ pints of warm water.

SERVICE OF MARES.—McD. Bros. would like to know (1) How many mares a draught stallion, 5 years old, should serve during the season? (2) How many per day? and (3) the distance the stallion should travel daily.

Answer.—(1) 70 to 80 mares. (2) and (3) No definite rule can be applied. Much depends upon the condition and temperament of the horse; and the number of mares to be served and distance travelled are matters for the discretion of the owner or man in charge for the season.

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THE ADVANCE OF THE SILO IN THE LILYDALE DISTRICT.

J. S. McFadzean, Dairy Supervisor.

Dairy-farming can be most profitably carried on under conditions which allow of the stock obtaining a full supply of green fodder throughout the whole year. Where pasture feeding alone is practised, the heaviest milk yield from cows is during the spring when grass is most luxuriant. The longer that growing season lasts the better is the flush of milk sustained. As the grass dries the milk flow diminishes.

By cultivating various fodder plants which mature at different seasons the farmer is able to forestall in some degree the annual spring pasture growth; and also to extend his fodder growing season well into the summer months. The term of the productiveness of his stock can thus be extended from early spring to late summer. Progressive dairy-farming, however, does not stop here. There is little reason in allowing a good spring and summer milk yield to be discounted in the year's estimate by poor returns being obtained during the autumn and winter months. The prudent dairy-farmer does not permit this to occur.

The farmer who has failed to make adequate provision for the winter feeding of his stock usually finds his milk supply rapidly diminishing at that season. Unfortunately, the majority of dairymen are rather neglectful in this respect; and consequently they fail to obtain the full possible returns that their farms are capable of. This too general disregard of the requirements of the stock results in a frequently recurrring scarcity of fresh milk in the metropolis during the autumn and winter months. The wholesale prices therefore range higher at those seasons. The farmer who is in a position to guarantee a consistent supply of milk throughout the year to a retailing dairyman is thus able to command a better average price for all he can produce, on account of the importance of his winter supply. But if he has milk to sell only at the season when it is most plentiful, he is offering his produce when the prices are lowest; and he gets but little consideration from the retailer.

Very often a farmer does contract to supply a regular daily quantity of milk to a retailer in the city. Should an unfavourable season for grass be then experienced, and he has failed to insure the production of his contract quantity by growing and conserving fodder for his stock, he will

be constrained to purchase manufactured food-stuffs to make up for that in which he is deficient. Should he be thus compelled to buy much of the feed necessary to produce his winter milk his profits will be small indeed. But if, on the other hand, he has a sufficiency of home-grown fodder in reserve, his milk will be most economically produced, and his profits proportionately increased. The providing of a full supply of winter fodder for the dairy herd has thus the dual result of insuring a good average price for the whole of the milk produced, and at the same time increasing the total yield at a minimum cost. Each cow may then become a source of profit to her owner during fully three-fourths of each year; instead of, as too often happens, being unremunerative for more than half her life-time.

The Dairy Supervisors of the Department of Agriculture are constantly placing before farmers the necessity of growing such quantities of fodder for their stock as will allow of a surplus being stored as silage for use as required. This advice is widely being acted upon. When the Dairy Supervision Act came into force in the Lilydale Shire in 1906, only seven dairy-farmers there had provided silage for their stock during the previous winter. In the season just passed provision for the cows by this method was made on 23 farms. On the seven farms alluded to silage has been made annually for many years past. On two other farms on which silage-making had some years previously been a regular custom, this work had latterly been neglected, and the pits had been allowed to get out of repair. However, fodder storage by means of the silo has again been practised these last two seasons, and on somewhat improved lines. In addition to these, sixteen new silos have been built, and on ten farms stack silage has been made. Last year, however, there were five of these latter, on which, owing to the dry season, no more maize was produced than the stock could use in the green state. These and several others will try to improve on last season's work in the future. Four of the new silos have not yet been used.

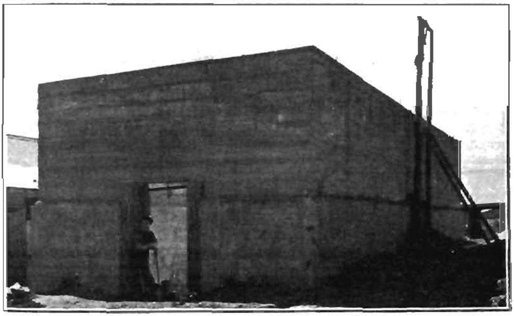
Maize is the fodder most generally grown for silage-making throughout the district; but on some farms a portion of the oat crop is also harvested to the pit, and used before the maize crop is fit to cut. The pits are again filled when the maize has matured.

On the twenty-three farms alluded to as having made silage during the past season there were 22 pits and eight stacks. Four of the farms had two pits each in use; and others used both pit and stack. All the old-established pits are below ground level, and are rectangular in shape. The newer ones are in most instances above ground; but some have also a few feet of their depth below the surface. The material used in their construction is more generally either brick, or wood with iron lining; but there are also those of concrete; of rough slab; of combination of brick, wood, and iron; and one earth pit with slabbed top. Some of the stacks were in the open; some had roofing over them; and others were inside walls of rough timber. On the whole the filling was well done, only two pits and three stacks having any quantity of waste material. In each of these instances, however, the total quantity dealt with was not large; and in consequence much greater care was necessary to have insured complete success.

In all the pits the crop was chaffed before being filled in to the silo. About 40 lbs. of this chaffed silage is the usual daily allowance for a cow; a varying quantity of some more concentrated food such as bran, grain, oil-cake, or the like being given with it in most cases. The stack silage being

made without chaffing, is not so suitable for manger feeding. For convenience of handling the chaffed material is also much to be preferred.

In extent of storage capacity and consistent use of this method of fodder conservation the Cave Hill Farm of Mr. D. Mitchell holds first place in the Lilydale Shire. The first silo on this farm was a square brick-lined underground pit holding about 100 tons, and was built about 24 years ago. Four years later, two larger ones were made, to hold about 140 and 130 tons respectively. These were somewhat similar in construction to the first one, but their positions were more convenient to the milking shed. The first one was then used for other storage. The smaller of the two larger silos, when first built, was 5 feet underground and 5 feet above ground level. The walls have since been carried up 8 feet higher by concreting, whereby its holding capacity has been increased about another 100 tons. This pit has no roofing; but the other is under cover.



230-TON SILO, MR. D. MITCHELL'S CAVE HILL FARM.
(5 feet underground, 13 feet above.)

No regular number of stock is fed here. About 35 acres of maize are usually grown for silage. Mr. Mitchell has other farm property in the district on which store stock are fattened. Among the stock purchased for this purpose any cows which prove in calf are brought to the Cave Hill Farm. If they do not turn out profitable as milkers they are speyed, and dried off for fattening. The number of milking cows on the farm is thus irregular. Last year a lot of starving stock from the northern districts were purchased, and their condition recruited on the silage. Mr. Mitchell claims to have been the first user of chaffed silage in the district, having made no other from the beginning. About 3 cwt. of hay chaff and 200 lbs. of bran are used with 22 cwt. of maize silage in mixing the present (July) daily ration for 65 cows. This works out at an average of 38 lbs. maize silage, 5 lbs. oaten hay chaff and 3 lbs. of bran per cow daily in addition to the pasture.

As regards combined length of experience and continuity of practice, Mr. A. B. Taylor holds a prominent position among the users of silage in the shire. His present farm is about 1½ miles out of Lilydale on the Melbourne-road; and during the seventeen years he has been dairying there

he has made regular provision each year for the winter feeding of his herd by means of silage. His first experience with siloed fodder dates some twenty years back, on the farm he then had at Croydon, which was afterwards purchased by Mr. McKay. In his first year of silage-making there the maize was put into the pit whole; and the trouble which was experienced in getting the material out again when required determined him in favour of chaffing before putting it into the pit, a practice he has always followed since.

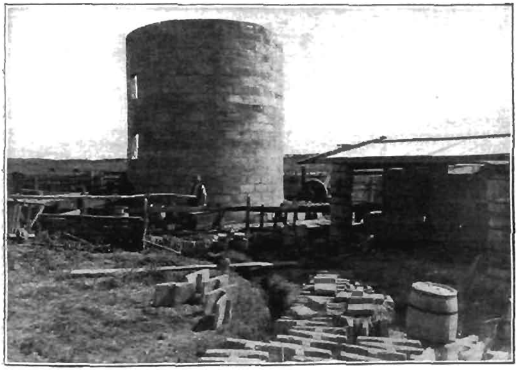
Mr. Taylor's present silo is a rectangular underground brick-lined pit of about 70 tons capacity. This usually is filled with the produce from about 6 acres of maize. Some 3½ acres of oats were also made into silage this year, and used before the maize was fit to cut.

Below the ground level the pit walls are built with a batter of about 8 inches in 18 feet. There is some 5 feet of straight up wall above this that is only intended to act as holding space for the maize at the final stage of filling so that enough will be held to insure the filling of the pit to the ground level when the material has finally settled. The sloping of the lower walls is considered a distinct advantage by several in this district, on the ground that it allows for a closer settling of the silage in the pit, and thus minimizes the possibility of side waste occurring through unevenness of wall surface.

Mr. John Kerr, of Yering, is the pioneer of the silo in the Lilydale district. Twenty-seven years ago he excavated a pit 45 feet long, 17 feet deep, and 15 feet wide at the surface and having a 9-inch batter on the side walls. This was filled with whole maize. Having reasonable success with this, another pit was made four years later—72 feet long, 17 feet deep, and 22 feet surface width. The walls of both pits were then bricked. At that time the farm was carrying a milking herd of 250 head. About 100 acres of maize were grown yearly; and the pits were filled regularly with this fodder for about nineteen years in succession. Some eight or nine years ago the dairy-work of the farm was reduced, and more attention given to grazing and hay growing. As the silo pits were not kept in use, they got into a state of disrepair; and finally the bricks were taken out, and the ground levelled up again. A renewed interest, however, is being taken in dairying this last two seasons and silage is again being used. Forty acres of maize were grown last year. The surplus of the previous season's growing had been made to stack silage. Then a circular concrete-block silo holding about 160 tons was built, and filled this season. The contents lasted the milking stock about four months. It is intended to increase the size of this silo before next season by making the wall 5 feet higher. If possible, two more silos of the same size will then be erected; for which purpose a quantity of the blocks have already been made. The milking herd, which had been reduced to 40 head, has now been raised to 150; and it is being still further added to as the management of the farm permits. A refitting of the milking-shed and dairy accommodation has also been effected, to allow of more expeditious working. The larger portion of the general farming, as well as the dairying work, is carried out by the several members of the family, each having charge of some particular section. All hired help is thus directly under interested supervision at all times: a method found to give satisfactory results.

Mr. Kerr, senr., has a turn for invention; and many notions are seen put to practical test throughout the dairy section of the farm, particularly among the utensils. Mr. Kerr is also recognised here as the originator of the lever system of bail-closing in the milking-shed. This idea was introduced by him 26 years ago; and it is now universally accepted as the most handy method of dealing with large herds.

In regard to silage-making Mr. Kerr has many experiences to relate, and suggestions to offer. One of these latter is put forward as a possible solution of an apparently inexplicable occurrence that has at times taken place in connexion with silage-making. In some instances reports have come to hand of a silo having been carefully filled with material that should have made good silage; and yet the result has not been satisfactory. Mr. Kerr suggests that the trouble may possibly arise through too much trampling—or rather from injudicious trampling—at some time during the filling. He considers that good silage can be made with a minimum of trampling providing the material is evenly spread in the pit. When silage was first being made on the farm in the large pits, it was observed that where the loads of maize were dumped into the pit the silage did not turn out as good in quality as in the other parts where the material was placed gradually in the spreading. The reason for this was set down as being that too much pressure was applied at one time to that particular place.



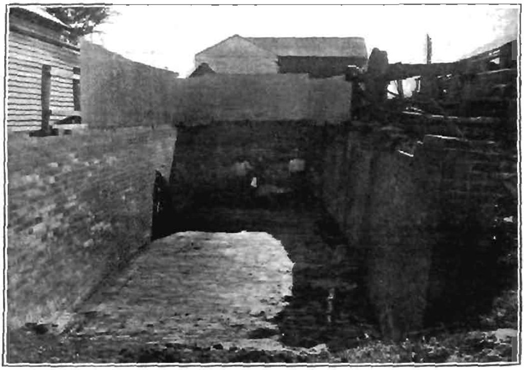
CONCRETE BLOCK SILO, MR. JOHN KERR'S FARM.

Thenceforward every endeavour was made to spread the maize without any more trampling than could not be avoided, and the result was satisfactory. Mr. Kerr's opinion is that possibly in those cases where failure has been reported, the heating material in the pit has been again well trampled down in the mornings before any more material was filled in; and it is the application of weight at that stage which he considers injurious. He arrives at this conclusion by the following theory:—

"Exclusion of air is the secret of good silage-making. This is obtained by the spontaneous heating and consolidating of an evenly packed body of green fodder. The effect of trampling on heating fodder is to expel some warm air wherever the weight is applied, and, owing to the spring of the material, to allow for some cold air intake as the pressure is removed. Overheating will result from this. If it were possible to evenly spread the chaffed fodder without any trampling it would slowly settle, and good silage would be made with a minimum of heating. Failing

this, however, no trampling should be done directly on heating silage. At least a foot depth of material should be filled into the pit each day before trampling is resumed; which will prevent the direct application of intermittent pressure to the heating silage beneath."

However, the object of trampling down the fodder when spreading it being to insure its even distribution, if that work is properly carried out, each day up to the time of leaving the pit, it is unnecessary to repeat the work next morning before fresh material is added. Still, as silage is occasionally more or less spoiled in the making, and no apparent reason for the failure is discoverable from the information supplied as to the filling, Mr. Kerr's idea is worth noting. That strange mistakes are made at times is shown from the investigation of one case wherein silage making was reported as not having turned out satisfactorily in this district. From the report, the filling appeared to have been done properly. On examination of the



HILLSIDE PIT SILO, MR. T. McINTYRE'S FARM.

material, however, it was found that the owner had endeavoured to make his maize crop go further in the pit by putting in some considerable bulk of dry straw with it. This fact he had not considered to be worth mentioning when complaining about the result. The mixture made rather an expensive manure, but it was fit for nothing else.

About eighteen years ago, the late Mr. David Syme put down the first silage pit on his Killara farm on the Yarra flats. This was a rectangular brick pit in the side of the hill, on the bank of the Wandin Yallock Creek. A race from another creek—the Woori Yallock—supplies the driving power for a water-wheel, by the aid of which the fodder is chaffed into the pit. This first silo was of about 95-ton capacity. Some six years later this was supplemented by another pit adjoining it, of the same width and length, but rather deeper, and holding about 15 tons more. These pits have been kept in regular use. About 100 acres of maize are grown to provide for a herd of from 200 to 250 milkers. A large proportion of the crop is fed to the stock green, being carted to the grazing paddocks in the

stalk and distributed there. The pits are filled as the maize reaches the ripening stage and any surplus then is made to stack silage.

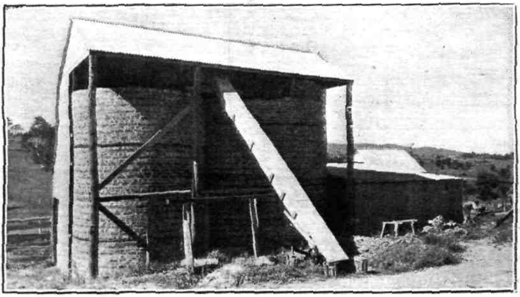
Mr. H. Parfitt, of Yering, also commenced making silage about 20 years ago; no exact record having been kept of the year. The pit used was an unlined excavation in the hillside, having one end open and a roadway from it to back the cart into when removing the silage. This pit was not lined; and of late years was not used, and allowed to get out of repair. Two seasons ago, however, it was lined with corrugated iron, and again filled, and it was also in use this past year. Its capacity is estimated at about 100 tons. Eighteen acres of maize are grown for a herd of 50 cows.

Another pit of much the same size and shape as the last-mentioned, is that on Mr. T. McIntyre's farm at Yering. This one, however, is bricked on the bottom, sides, and one end. It has also a 5-foot corrugated iron top to the walls to assist in the filling. Silage has been made here for eleven years in succession. Twenty-seven acres of maize are grown for 70 cows.

Probably the most consistent feeder throughout the year on silage in this district is Mr. Robert Blair, of Mooroolbark, whose exhibit of this fodder at the Royal Agricultural Show attracts considerable attention each year, its quality being excellent. On 126 acres he milks from 24 to 28 cows daily the whole year. The grazing land is subdivided into a number of paddocks, and sown with mixed grasses. This is well looked after, not being grazed too close at any time, and each paddock is top-dressed with manure and fertilizers as necessary. Ten acres of maize, and 11 acres of oats, are sown for fodder each season. Seven years ago, a rough slab and paling enclosure was built in the side of the hill, above and adjoining the milking shed. This was about 24 feet long by 16 feet wide, and the surplus of the maize crop of that season was chaffed into this. When settled the material was about 7 feet deep; and the quantity was estimated at about 30 tons. This fodder storage proving successful, the work was continued yearly; until, in the fourth year from starting, a portion of the oat crop was also made to silage and used while the maize was growing, the cows giving very good returns on this feeding. Before the next season's harvest was at hand a round brick pit 14 feet high, by 11 feet diameter was built; 6 feet of the wall being below ground level. This pit was used in addition to the slab silo, both oaten and maize silage again being made. Then the following season the slab structure was taken down; the brick silo was increased in height by 10 feet, and another—a larger one—24 feet high by 18 feet diameter, was also built. Mr. Blair estimates the capacity of these pits as 40-ton and 70-ton respectively. The smaller one was filled in December last with oats cut from 3¾ acres. This was opened for feeding on 20th January, and lasted about 80 days. Both pits were then filled with maize, and the silage from these has been fed from that time at the rate of about 45 lbs. per cow per day; and is expected to last well into the spring.

Mr. Blair estimates the difference in quality between his oaten and his maize silage to be equal to about an extra 2 lbs. of bran daily in favour of the oats. This, however, is with maize sown broadcast, and consequently not well cobbed. As yet none of these farms mentioned have taken up the drill sowing of maize for their main crop, which accounts for the comparative large acreage of maize sown to the silage conserved. As a general thing, there has usually been a sufficient rainfall in the summer to give a fair growth of maize here, and some of the farms also have irrigation facilities. Up to recently the owners have been satisfied if they obtained

a sufficient bulk of fodder, and gave no attention to its quality. This last season, however, proved an exception to the average and most of the crops were considerably under the full requirements of the stock even in bulk; while the quality was much poorer than usual. Some small sowings on the drill system were also made here last year; and the yields from them were much better comparatively than from the broadcast crops. Against maize that has been grown under the old broadcast system, oats must always compare very favourably as fodder if cut in the proper stage. But when maize is properly grown, and so has a chance to cob well, the difference in quality between the two fodders is very slight. In bulk return, also, oats can never compare with drill sown maize as a material for silage. Actual height of a maize crop is too often taken as indicative of a good yield, while the possible quality is totally overlooked. Instances have been seen, both in this shire and elsewhere, in which cattle have been fed all they could eat of the long spindly growth resulting from broadcast sowing, and they actually lost condition on it. Yet the owners could not be persuaded that it was their system of cultivation that was at fault. They blame the



MR. R. BLAIR'S BRICK SILOS.

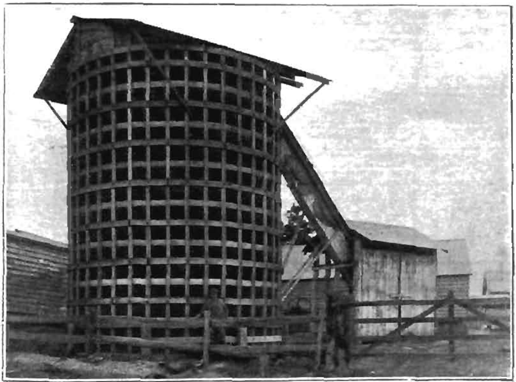
maize as a fodder in a general way, despite the fact that properly grown maize gives satisfaction every time. It is usually the man with the small acreage that gets the heaviest yields in his maize cropping; for he is compelled to work his ground to its best advantage.

Mr. Blair's milking herd is a grade Ayrshire. Besides being well fed, the cattle are closely culled. The result of the combination of these methods is demonstrated in their last year's milk yield which averaged 580 gallons per cow.

On the farm of Mrs. Sherlock, at Mooroolbark, silage has been made on a small scale for seven seasons. The first silo here was an enclosure of old railway sleepers in a large barn. Three years ago a pit was dug nearer the milking shed. The earth taken out was banked up round the top against a slab wall, making a pit 13 feet deep, and 9 feet square throughout. This holds about 15 tons of chaffed maize, which is used to feed six cows.

Mr. W. Rae, also of Mooroolbark, has used silage for his dairy herd for five years. The pit here is a double one of brick, below ground level. It was originally one large pit 20 feet by 12 feet by $13\frac{1}{2}$ feet and estimated

to hold 100 tons. A dividing wall of brick was built across it two seasons ago for convenience of working. The smaller top surface of each section now allows for more even spreading of the material when filling; and it also reduces the possibility of waste when using, such as might occur through having too large a surface exposed to the air. One of these pits was filled with oats this season; 3½ acres of this crop providing silage for 25 cows for six weeks. Eleven acres of maize also were grown. Of this a large portion was fed to the cows green, and the balance was siloed. This pit at first gave a good deal of trouble with side waste; through, it was supposed, the bricks in the walls being soft and admitting air. This porous condition of the wall surface was, however, much improved by giving it a coating of tar when the pit was emptied; and with another dressing it is expected that it will be made impervious to air or water, and completely satisfactory in its working.



WOOD AND IRON OVERHEAD SILO, MR. L. LITHGOW'S FARM.

As compared with those mentioned, all the rest of the farmers now making silage in the Lilydale Shire are new to the work; but, with the exceptions mentioned at the beginning, their results have been equally satisfactory. Among them, Mr. Gilbert, of Yering, may be specially mentioned as getting very excellent returns from his stock on maize silage. In February last his 28 cows were yielding 50 gallons of milk daily. At the end of July, 21 head were giving 43 gallons. The additional feed purchased in this instance was only 14 bushels of bran weekly. This silo is one of the circular wooden-framed iron-lined silos erected by the Department, which are giving general satisfaction.

The largest of the new overhead silos in the shire is that on the farm of Mr. L. Lithgow at Yering; it has a capacity of 120 tons and has been in use two seasons. Twelve acres of maize are grown for a herd of 70 milkers; and in addition to the silo full of chaffed maize, there was also this year a stack containing about 25 to 30 tons. This latter, being in the stalk, was fed in the paddock to the dry stock; and a good deal of it was wasted through being trampled on and soiled by the cattle.

For two seasons past Mr. G. Grey, of Lilydale—who has a small farm adjoining Mr. A. B. Taylor's—has successfully used an overground slab silo built somewhat on the same principle as the first one used by Mr. Blair. This is 14 feet by 16 feet, and 9 feet high. Five acres of maize are grown and fed to about fifteen cows. Where bush timber is plentiful the cost of a silo need be little more than the price of the labour employed in its making.

Throughout the Upper Yarra Shire, which adjoins that of Lilydale, dairy farming is at present only carried out on a somewhat small scale; but on four farms silage was made this past year; and others are also preparing to take on the work this coming season.

With three years' experience, Mr. John Smith of East Warburton is worthy of mention. His silo is a large slab room 18 by 16 by 10 feet, adjoining his milking-shed; and the fodder is put into it without chaffing. In addition to his silo full of oats he had, this past season, about 20 tons of maize in stack. The oaten silage was cut into on the side. Part of this face, which had been cut down with a hay knife, was covered with a

A CHEAP AND EFFECTIVE SILO, MR. G. GREY'S FARM.

The drawback to this silo is that, being on level ground, the filling must be done by hand, whereas, in a hillside position, the material would fall in direct from the chaffcutter.

plaster of earth to ascertain if silage could be preserved from rotting by this means. The experiment was not successful, as there were a few inches of mould behind the earth when it was removed. On the whole, however, both lots of silage on Mr. Smith's farm were a success. In the maize stack it was estimated there was not 50 lbs. of fodder wasted.

This farm is some 8 miles past Warburton, high up in the valley of the Cement Creek, which is one of the numerous mountain streams flowing into the Upper Yarra. Owing to the situation, cartage to the farm in this and similar localities is very expensive. Owners are therefore practically compelled to produce on their farms everything that they use in the way of stock fodder. This they are able to do, as the soil, which is a red volcanic, is very fertile. Cocksfoot and the clovers make good pasture where sown. A tall-growing native fodder plant, somewhat resembling millet, and known as the "wild oat", makes a heavy growth on the upper ranges during the summer months, and stock fatten very quickly on it. In the winter these same ranges are very often impassable with snow; and, when left to forage for themselves, stock are then frequently lost from starvation. In its natural state this country is very heavily timbered, and a lot of burning-off has to be done before the land is cleared for cultivation. This work

of burning does considerable injury to the surface soil by destroying its humus content; with the result that it dries very quickly in the warmer weather, and only well-rooted crops can withstand even the moderate heat that is experienced here in the summer. On the other hand, irrigation of the land is easily effected by diverting water from the numerous mountain streams; and abundance of fodder can be grown in this way. Owing to the labour of clearing, some years usually elapse before a settler here has much extent of cultivated ground; and only during the summer and early autumn months can any profitable returns be obtained from dairy stock meanwhile. Under these conditions, the best milking stock have usually the hardest struggle for existence. The short-season milking cow ceases to be productive sufficiently early in the autumn to enable her to put on some condition before the cold weather sets in. But the good dairy animal continues to give milk for a much longer period, and the winter comes before she has a chance to fit herself for it. Unless winter feeding is practised therefore the best of the dairy cows soon perish, and only the inferior stock remain. Where cows are fed whilst being milked this calamity is avoided; for the longer they continue in milk, the longer their feeding term lasts. They are thus kept in better order, and are enabled to make a good showing in consequence when they next come in.

Among dairy farmers everywhere the use of the silo is making towards a general improvement of the stock. Systematic feeding gives the best cows a chance to show what they are capable of; and those which do not milk well for more than a few months each year are the more easily noticeable. Under regular feeding the beefy cow tends to fatten and turn to profit as butcher's meat; while the dairy type of cow will give her profit through the milk bucket. The dairy-farmer therefore runs no risk whatever by the regular feeding of his stock, as it in every way increases their value. Also, without a proper system of feeding, culling is of little use. The providing of a sufficiency of succulent food for the stock throughout the autumn and winter months is thus unquestionably the most effective step towards the improvement of dairy-farm returns.

SILOS AND SILAGE.

A. S. Kenyon, C.E., Engineer for Agriculture.

(*Continued from page* 671.)

Several interesting letters from farmers making and using silage will to be found in the October issue of the *Journal*. Two others, held over owing to want of space, are now published.

Mr. R. Faragher, Koroit, finds oaten silage not so good as grass. This is particularly the case in such a district. It must be always remembered that siloing a crop does not alter its feeding value, merely preserves it. Oats, whether fed as green stuff, as silage, or as hay, will never equal natural grasses at their best in the spring time:—

"I filled the silo in November last with Algerian oats. At the end of December I started feeding to 40 cows. The grass at this time was drying off very rapidly, but I must confess I was rather disappointed with the result so far as keeping up the milk supply was concerned. I found it not nearly equal to green grass; our grass is of a very rich nature, being rye grass and clovers. Otherwise, I was quite satisfied with silage. It kept the cows in fine condition with very sleek healthy appearance, far superior to hay which often causes impaction in dry summers. The loss through damaged sides was very slight, and

there were no mouldy patches except some weeds we cut and put in the bottom; these were too dry when put in and went mouldy. I used water for pressure. I placed a tank on top and pumped water into it. It weighed about 3 tons. This year I have two tanks made to fit on top when I will be able to put plenty of pressure on, but the tanks add considerably to the expense. I think silage a good summer fodder, as it keeps the cows in good health and keeps up the milk supply when everything is so dry. I feed out in the paddocks, and find very little wasted. I think what we want to study most is what materials to grow for silage, 1st, for milk results; and, 2nd, for greatest yield per acre."

Mr. G. Perry, Ballarat, writes a most valuable letter. His experience in underground silos is long:—

"I beg to state that as far as the quality of the silage in the overhead silo is concerned, it has turned out satisfactorily, but, unfortunately, the quantity was lacking. Owing to various delays, the silo was not completed until well on in December, and the crop—barley, beans, vetches, and oats—was much too ripe and dry for making satisfactory silage, but we rather more than half filled it on that occasion, and by using water freely and treading it well we were agreeably surprised at the quality of the silage. We opened it about the end of January. It was weighted with about 2½ tons of bricks, and it had shrunk barely 2 feet, which speaks for the manner in which it was trodden. We used a layer of about 6 inches of straw chaff thoroughly saturated with water on the top of the silage, then a layer of old bags, and on top of these distributed the bricks evenly all over. The cows ate it readily, and it was altogether really splendid silage. The waste did not amount to more than about 3 cwt.

"We have an underground silo in the milking shed put down about seven or eight years ago, with concrete sides, 18 feet deep by 11 ft. 6 in. diameter, which we had previously filled with a mixture of barley, rye, vetches, peas, beans, and oats, a sample of which gained first prize at the Grand National Show held at Ballarat last year, and which was very much admired by all who saw it. We had a very good crop of maize, about 20 acres, and started to cut it early in March. We filled the underground and half filled the overhead silo. The remainder of the maize (fully half) was scarcely ready, but that very night a severe frost followed by a heavy north wind, cut it down hopelessly, and frost followed frost until we were reluctantly compelled to turn the cows on to it.

"We have sown our maize in drills 3 feet apart ever since it was first advocated in the *Journal of Agriculture*, some four years ago. I think we were the first in this district to adopt it. Most of our neighbours are now convinced that it is the best, although at first they said we were wasting a lot of ground. The maize silage turned out just as satisfactorily as the barley, &c., mixture. The cobs had glazed before cutting. The waste was nil. We are at present feeding with it mixed with a little oaten chaff and a little grains and bran. When filling the silos we used a piece of gas pipe, about 9 feet long, and kept a thermometer in it. The barley mixture, owing to it being on the dry side, was about 85 deg. at the centre of the pipe and a little less at the bottom, but when the weight was added the temperature quickly dropped to below 70 deg. The temperature of the maize silage never rose above 58 deg. in centre of pipe. It may interest you to know that silage was first made on this farm in 1883 in a big open pit, the material for which was chaffed and trodden in by ponies ridden by boys. Then about seven or eight years ago the silo was sunk in the cow shed immediately below the chaffcutter, which is in the loft above. By simply taking the cover off the silo the chaffed material falls in. The cover when on forms the floor of the chaff-room, so that we can fill either silo or cut horse or cow chaff at pleasure, without shifting any of the plant. Our power is a Ronaldson oil engine. The experience of a number of years in making silage is that the two greatest factors to success are (1) that the crop to be treated is in the proper stage of maturity; and (2) that great care is taken in filling to trample it well. We use water freely, and think it a better plan to put the salt in the water in preference to throwing it in loose, as we think it is more evenly distributed by this means. We throw six or eight bucketfuls on with every 2 or 3 tons of material, using a little more or less according to condition of crop."

The accompanying illustration shows a silo elevator connected with chaffcutter. To get the elevator well under the cutter the ground has been excavated and the cutter elevated. Looking towards the silo the feed is from the right hand, and driving with a chain from a sprocket on the

cutter spindle to sprocket on elevator the slats will work up the bottom floor of elevator. In order to make the slats work up the top floor an idler sprocket (the bottom sprocket in illustration) has been introduced. The chain is taken from cutter sprocket round idler, and the idler is so fixed that the chain catches six sprockets of wheel on elevator. In the illustration is shown a chain tightener fixed to a piece of timber secured to legs of the chaffcutter. To insure clean working all three sprocket wheels should be in one plane, and chain should not be allowed to get too slack.

SILO ELEVATOR CONNECTED WITH CHAFFCUTTER.

It will be noticed that the drive of the chain on the elevator sprocket is on the pulling side. This arrangement works smoother than that shown in last month's *Journal*.

STACK SILAGE.

In a season like this when there is an abundance of growth, such as weeds, wild oats, trefoil, thistles, &c., which, if not saved, will go to waste, many tons of valuable fodder may be conserved in a succulent condition for the dry weather of summer and autumn or for lean years and drought times, by making this material into silage. A quick and convenient method is to make a square stack upon a log bottom, keeping the

centre high. If the material has been harvested with a binder, cut the bands of the sheaves and spread them; then cross them in alternate layers of 6 inches deep. It is often advisable to put up posts to prevent the stack slipping. Weight with logs hung on wires across the stack each night and remove them in the morning. Sprinkle salt through the stack as it is being built. Finish off the stack in a suitable shape to resist the weather. Weight with logs hanging from wires passed across the top of stack. As the shrinkage will be considerable it is necessary to shorten these wires every day until the stack finally consolidates. The total weight need not be great, but as much as can be conveniently hung on the wires. Do not build near any buildings, hay or straw stacks, as there is some slight danger of spontaneous combustion. A stack built like this will keep in good condition for a very long time, and is much cheaper to build than to purchase fresh stock after the ravages of a drought.

Another convenient plan for making stack silage is to set up a circle of saplings to keep the outside of the stack upright. This may be kept from spreading by running a double circle of fencing wire around them at intervals of every 3 or 4 feet. If the stack is located under a tree, with a suitable branch 25 feet from the ground, a pulley can be attached to this and used to hoist up the last of the fodder. In this case the stack may be weighted with earth, hoisted up in the same way in an old oil drum or bag.

DAIRY HERD COMPETITION.

Report on First Prize Herd in Competition in Dandenong Electorate for Prize presented by Mr. W. S. Keast, M.L.A.

Geo. McKenzie, Dairy Supervisor.

Attached are the compiled records of Mr. George McLellan's dairy herd at Lyndhurst.

Out of 47 cows included in the sheets only fifteen were milked throughout the whole period of the test, viz., from 1st September, 1908, to 28th February, 1909. These yielded a total of 7,022.8 gallons, averaging 468.1 gallons per cow for period, or 2.58 gallons per cow per day. The highest individual yield for cow milked during the whole period was 605.8 gallons or 3.34 gallons per day, and the lowest 374.2 gallons or an average of 2.06 per day.

Nineteen cows came in at various dates during period the records were kept and remained until they were discontinued (28th February). Records of these were kept for periods varying from 172 days to fifteen days. The best of these was No. 6, Table A, with a total yield for 106 days of 486.0 gallons, averaging 4.58 gallons per day. Two others (Nos. 22 and 23) for a period of 92 days yielded 384.0 and 383.9 gallons respectively averaging 4.17 gallons per day. The remaining thirteen cows had been milked for various periods prior to records being kept, and these were dried off from time to time and replaced by cows mentioned above. Table C gives records of these cows which were practically strippers. No butter fat tests were taken.

A.—RECORDS FROM CALVING DATE, COMMENCING 1ST SEPTEMBER, 1908, AND ENDING 28TH FEBRUARY, 1909.

Name of Cow.	Weeks Calved.	Days Milked.	Total Milk.	Average per Day.
			lbs.	gallons.
1. Hannah	27	181	6,058	3.34
2. Ladylike	27	181	5,558	3.07
3. Lady Craig	27	181	5,171	2.80
4. Chapman	27	181	5,026	2.77
5. Rabbit	30	181	4,969	2.74
6. Marguerite	15	106	4,860	4.58
7. Smalley	26	181	4,811	2.65
8. Beauty	25	172	4,767	2.79
9. Annabelle	17	120	4,725	3.93
10. Gem	27	181	4,706	2.60
11. Fairy (B. and W.)	28	181	4,673	2.58
12. Florist	27	181	4,580	2.53
13. Pearline	27	181	4,483	2.47
14. Ted Greaves	28	181	4,445	2.45
15. Diana	22	151	4,402	2.91
16. Daffodil	21	143	4,215	2.94
17. Beulah	Not known	181	4,184	2.31
18. Blossom	22	151	4,117	2.73
19. Belle 1st	30	181	3,991	2.20
20. Jewel	24	168	3,935	2.34
21. *K. Chapman*	26	181	3,845	2.13
22. Alice	13	92	3,840	4.17
23. Nancy	13	92	3,839	4.17
24. Belle 2nd	28	181	3,742	2.06
25. Beatrice	17	120	3,299	2.74
26. Novice	18	127	3,278	2.58
27. Bonny	17	120	3,153	2.62
28. Minnie	13	92	2,683	2.91
29. Pansy	13	92	2,628	2.85
30. Daphne	13	92	2,550	2.77
31. Chalk and Water	7	43	1,297	3.01
32. Young Mermaid	5	29	684	2.35
33. Pride	5	29	682	2.35
34. Old Pearline	3	15	321	2.14

B.—RECORDS OF TOTAL MILK YIELD DURING COMPETITION.

Week ending—	Number of Cows.	Weekly Total of Milk.	Daily Average Herd.	Daily Average per Cow.
			gallons.	gallons.
September 5	28	3,073	61.46	2.19
,, 12	29	4,255	60.78	2.09
,, 19	29	4,498	64.24	2.21
,, 26	29	4,637	66.24	2.28
October 3	31	4,902	73.54	2.37
,, 10	25	5,050	72.14	3.00
,, 17	25	5,246	74.94	2.99
,, 24	23	4,948	70.52	3.07
,, 31	24	5,013	71.61	2.98
November 7	27	5,541	79.15	2.93
,, 14	27	5,369	76.70	2.84
,, 21	28	5,587	79.81	2.85
,, 28	27	5,361	76.58	2.83

B.—Records of Total Milk Yield During Competition—*continued.*

Week Ending—		Number of Cows.	Weekly Total of Milk.	Daily Average Herd.	Daily Average per Cow.
				gallons.	gallons.
December	5	32	6,547	93.52	2.92
"	12	32	6,535	93.35	2.91
"	19	31	6,376	91.08	2.93
"	26	31	6,224	88.91	2.86
January	2	31	6,028	86.11	2.77
"	9	30	5,643	80.61	2.68
"	16	30	5,609	80.12	2.67
"	23	31	5,866	83.80	2.70
"	30	31	6,071	86.72	2.79
February	6	33	6,142	87.74	2.65
"	13	33	5,836	83.37	2.52
"	20	34	5,469	78.12	2.29
"	27	34	5,034	71.91	2.11
"	28	34	742	74.20	2.18

The average number of cows milked per day for the period from 1st September, 1908, to 28th February, 1909, was 29.42; *the average milk yield of herd per day for same period was 78.19 gallons*; and the average quantity of milk produced per cow per day was 2.65 gallons. The total quantity of milk produced by herd for the whole period was 14,160.2 gallons.

C.—RECORD OF "STRIPPERS," COMMENCING ON 1st SEPTEMBER, 1908, AND ENDING ON DATE GIVEN IN SECOND COLUMN.

Names of Cows.	Turned Out.	Days *Milked.*	Total *Milk.*	Average per *Day.*
			lbs.	gallons.
Mermaid	2.1.09	124	2,787	2.24
Maggie	12.12.08	103	2,526	2.45
Julia	21.11.08	82	1,774	2.16
Camelia	18.10.08	48	733	1.52
Bena	17.10.08	47	710	1.51
Old Belle	1.10.08	31	527	1.70
Frazer	3.10.08	33	510	1.54
Queen of Ayr	..	33	504	1.52
Dainty	..	33	500	1.51
Fairy	..	33	484	1.46
Brindle	..	33	469	1.42
Young Lady Green	30.9.08	30	396	1.32
Young Nancy	12.9.08	12	160	1.33

These cows were milking for some time prior to 1.9.08, when records were first kept, and the dates when they calved could not be given. They were turned out, and replaced by others on dates stated in column above.

LOSSES IN LAMB-MARKING.

H. W. Ham, Sheep Expert.

With the raising of the best class of export lamb, come new methods of management, amongst which are the judicious crossing of breeds, tail-searing and early castration. That these latter methods are steadily gaining in favour is certain, but there is a good proportion of farmers who have suffered more losses by these methods than they did under the old ways, and a great many have not as yet ventured from the early day, rough and ready, methods of the large wool-grower, with whom speed was the chief consideration, and, under his conditions, often with good reason.

One thing is certain, we could be much more careless with lambs grown for wool purposes than we can afford to be now with lambs intended for export. There is less danger in castrating store lambs of any age than there is with fat lambs. There is also more risk of checking growth and of loss by tetanus in sappy full-blooded lambs of the British breeds, than there is in merinoes.

Many farmers hold that, once lambs are allowed to get to six or eight weeks old before marking, it will pay better to sell them at about twelve weeks old, with the testicles in, than to lose a percentage of them in marking, which is almost inevitable, no matter what method and care is practised at this age, especially so if wind and rain be met with within a few days. It is not the deaths that form the greatest loss with prime lambs at this age either. It is the fact that all the ram lambs undergo such a check that they cannot recover in time to go off and look like, or strip the same as, the ewe lambs. The younger they are marked the better, but here again there is no fast rule. A strong lamb born in favourable weather can be marked with safety at two days old, whereas a weakly lamb from an ill-fed mother needs fully seven days before it is safe to mark it.

Young ram lambs are the better for not being tailed when castrated. They can be done later on with the ewe lambs. Searing does not check sappy lambs like castration. There appears to have been less danger in castrating ram lambs before searing became known. With sappy lambs, there is no bleeding at the tail when the tail is seared at the time of castration and, consequently, there is a greater rush of blood to the purse than was the case when the tail was cut with the knife.

Lambs castrated and turned immediately on to long wet grass or fodder crops appear to contract tetanus; lambs on rich pasture land develop it more than those on poorer soil. A lowering of the temperature, through wind and rain, or frost, appears to favour the development of tetanus. Wind, especially, is bad for causing a form of inflammation to set up. According to the best authorities, tetanus can be developed from within the wound as well as by coming in contact with spores through lying down, or moving in long grass. The former is most probable in such a severe season for cold wind and excessive rain as we have just experienced.

Searing cannot cause any deaths in lambs of any age, if done properly. An occasional one may bleed to death as in cutting with the knife, especially if the lambs be full blooded, and the day warm, and the lambs have just been yarded after being dogged and allowed to ring round and round all the way from their paddock, as is too often the case. If, in searing, the skin and flesh be stripped off (as is often done

by beginners when not striking a joint), the operator should know what to do to stop the bleeding. A light touch with the iron on the veins will often stop the few that do bleed, but at odd times it may be better to take a small portion off back to the joint. Most operators, when first beginning searing, draw the tail tightly, and this, together with the fact that they do not strike a joint, causes them to leave a portion of the bone projecting past the flesh and skin. The tail should be held loosely and pushed towards the lamb a little. In this case, the loose skin will come back and cover the vein and bone better, and prevent severe bleeding in the few cases that may miss.

To be successful with the searing iron, the main object is to remember to go through with a clean straight cut: for, if the bone be left projecting to any extent and the skin and flesh cannot heal over the bone, it will decay back until the flesh can cover it. Any instrument that will sear straight through should be satisfactory: there is no necessity to strike a joint. Burning the lambs is mostly the fault of the holder. Dull heat is better than red heat. During summer searing attracts flies more than the knife.

Several methods of castrating lambs are practised. With very young lambs there is little choice, as they are not very far advanced. Some methods are cleaner and neater than others and more suitable for small lots of very young lambs when done every few days during lambing time. The particular method mainly depends on the numbers to be done, as it may be a matter of speed. With any method there is little or no danger, comparatively speaking, with lambs up to ten days old. In the case of lambs beginning to thrive and put on flesh, the danger increases with all methods.

Cutting off the lower portion of the purse and drawing the testicles is largely practised. The objection to this method is that, if windy weather is experienced, the losses are sometimes heavy; also, the open cut is considered bad in dirty yards or long wet grass. In every other way it is the best. Slitting is favoured by most large owners. It is not so objectionable in windy weather and there is not the same outward wound, but it is inclined to close and heal quickly and collects blood, especially when closed with the hand as many advocate. If cold weather sets in tetanus at times develops in this class of castration and many deaths have been known with this method.

Side cutting and taking the testicle out is only practised on very young or store lambs. If lambs are sappy and a fair age, blood collects in this method also, especially with tail searing. If tetanus develops through bad weather, or the spores of tetanus are prevalent on the pasture there will be losses by this method also, especially if the lambs are a good age.

A method often practised on old lambs is to remove the testicle from its casing, leaving the casing in (similar to castrating a calf). This causes no more risk, and in the case of a lamb six weeks old is not so severe as drawing. A later and better method still for export lambs, when once the mistake has been made of letting them get too old, is to slit the purse and cut into the testicle and press out the inside flesh with the finger and thumb, leaving everything else in, including the point of the testicle. By this method the blood vein feeding the testicle is not severed, and less bleeding and no bruising of the inward parts of the lamb are caused. Young lambs cannot be treated this way, and there is no advantage if they could. Of course, tetanus may develop with this latter method, on this class of lamb, but it is the least likely to

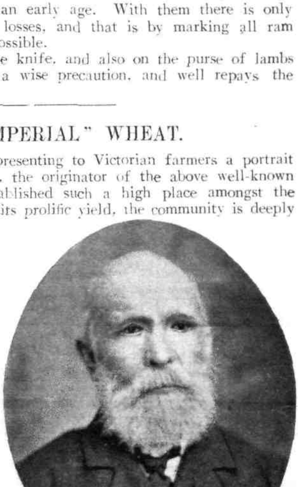
of any, and certainly is the easiest on the lamb. An objection raised *to it is. that if they are held over as grown sheep, wethers castrated* this way will be staggy. This stagginess is very slight, and is hardly worth considering; very little more can be noticed than is apparent on other lambs when marked at the advanced age.

Lambs on such good milkers as cross-bred ewes, when sired by the early maturing black-faced rams, and the ewes are well fed, are extremely sappy and forward at an early age. With them there is only one way to save checking and losses, and that is by marking all ram lambs once a week, if at all possible.

The use of antiseptics on the knife, and also on the purse of lambs before making any incision, is a wise precaution, and well repays the trouble.

"DART'S IMPERIAL" WHEAT.

We have great pleasure in presenting to Victorian farmers a portrait of Mr. Thomas Dart, of Nhill, the originator of the above well-known wheat. As this wheat has established such a high place amongst the varieties grown in Australia for its prolific yield, the community is deeply indebted to the original grower, and the recognition of this fact some time ago led to a movement in the Nhill district to present Mr. Dart with a monetary testimonial. He, however, declined to receive anything of the sort, and consequently the movement was not proceeded with. Mr. Dart is still hale and hearty at the age of 73 years, 71 years of which have been passed in South Australia and Victoria.


MR. THOMAS DART, NHILL.

Mr. Dart gives the following account of how he came in possession of this wheat :—

"I was stripping a very rusty crop at Lucindale in South Australia in 1882. Noticing a nice looking root of wheat I stopped the machine, got off and examined it, and finding it quite free from rust I pulled it up and gathered 44 perfect heads from the one plant. The same year I removed to Kiata in Victoria and sowed it there, but not with very encouraging results, as the cattle got in and partly destroyed it. By persevering with it I managed to gather 13 lbs. weight that year. The following harvest my chief trouble was with the rabbits and I only gathered 45 lbs. that year. In 1885 I sowed it again, but the rabbits found it out once more, although I was often around the plot at midnight. However, I stripped it with the machine and got 3 bushels. The following year I sowed this on 4 acres of fallowed ground with better results, as 16 bags each containing $4\frac{1}{2}$ bushels were stripped and cleaned. As a matter of fact only about 3 acres were stripped, as two swaths around it were cut,

and in addition there were 15 gum trees on the plot. I gave one bag of the seed each to Messrs. J. W. and T. Gould of Warracknabeal, and also to my three sons at Woorak West. This year the new wheat was called "Bluey." Mr. J. W. Gould obtained first prize for this wheat at Murtoa Show and he then gave it the name of "Dart's Imperial."

"Dart's Imperial" is one of the very best all round farmer's wheats yet introduced into Victoria and perhaps combines the qualities required for both grain and hay in a higher degree than any of the commonly grown varieties. The comprehensive experimental plots which have been conducted throughout northern Victoria during the last four years confirm the high estimate in which it is held by farmers throughout the north-west.

The notes of Mr. F. E. Lee, Agricultural Superintendent, on this wheat, are as follow:—

The following are the average yields recorded upon 26 fields:—

Year.	Mallee. Bushels.	Wimmera. Bushels.	Northern Plains. Bushels
1905	14.5	21.1	20.6
1906	15.1	26.9	22.3
1907	14.0	13.5	14.2
1908	14.3	18.0	14.0
Average	14.4	20.3	17.7

These returns by no means indicate the highest yields obtained. For example, 28.1 bushels per acre were obtained at Nhill on Mallee land; 37.5 bushels per acre at Jung from typical Wimmera soil and 21 bushels per acre from the poor country in the vicinity of Marong.

"Dart's Imperial" belongs to the Purple Straw type of wheat, although slightly later in ripening than the majority of that family. It is not absolutely immune to rust, but so far seems better able to withstand the ravages of this pest than most of its type. The straw is of medium height and the plant of compact growth. It is further characterized by strong straw and abundant foliage. The ears are tip-bearded, rather large, uniform in size and slightly clubbed at the tip. The grain is medium sized, plump, white and soft.

From a milling point of view, "Dart's Imperial" is considered an excellent grain. It is easy to mill, fairly rich in gluten, and yields a high proportion of flour, which bakes well. For baking purposes, the flour is somewhat low in strength or water absorbing capacity.

The following is the average milling analysis:—

Weight per bushel	62 lbs.
Flour	72 per cent.
Pollard	14 per cent.
Bran	14 per cent.
Colour of flour	Excellent, good surface & texture
Gluten	11 per cent.
Nature of gluten	Yellow, soft, coherent & elastic.
Strength	48 quarts of water per sack of 200 lbs.

The above information serves to emphasize the value of trained habits of observation amongst farmers. There is every reason to think that many of our familiar wheat varieties could be improved from year to year by the selection of prime heads in the field. It may be remarked that the Education Department in Canada distributes prizes amongst school children in rural districts for the best collection of prime heads of grain. A similar effort in this direction would secure the hearty co-operation of the Department of Agriculture.

BEES AND FRUIT FERTILIZATION.*

R. Beuhne, President of the Victorian Apiarists' Association.

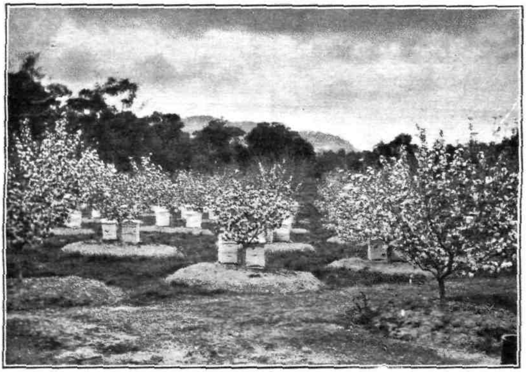
The blossom of fruit trees consists of the calyx or cup, the sepals or or short green leaves which cover the bud before it opens, and the petals of various shades of white and pink, inside which are the stamens carrying the anthers or male organs producing that extremely fine fertilizing powder called pollen. The stamens, of which there are many in each flower, surround the pistil; in the case of the blossom of stone fruit there is one; in apples, pears, &c., there are five pistils. The upper part of the pistil or female organ, is the stigma, with a duct or passage leading down into the base of the pistil. To produce a fruit it is necessary for a pollen grain to reach the stigma. Pollen grains, though small, are of ornamental appearance, and complex in structure, consisting of an outer and inner covering, the latter enclosing a jelly-like protoplasm containing nitrogen and other chemical matter. Lodged on the stigma, the pollen grain absorbs moisture, swells, and throws out a tube, which grows down the pistil till it reaches the unimpregnated nucleus in the ovule, which is situated in the ovary at the base of the pistil. Thus fertilization takes place. In the case of an apple blossom there have to be five distinct fertilizations corresponding to the five divisions of the core, while with the blossom of strawberries, raspberries, and others over one hundred fertilizations are required. If any of the pistils fail to receive pollen a deformed fruit results—an apple depressed on one side or berries showing hard, green undeveloped places on the ripe fruit. If an apple so deformed is cut crosswise no pips will be found in the section underlying the undeveloped part, and such apples usually fall before reaching maturity. It is therefore important that a pollen grain should reach each stigma, and that pollen grain should come, not from the anthers of the same flower, but preferably from a flower on another plant of the same species.

According to Darwin, the cross fertilization of flowers is the most important factor in the continued vitality of any species of plant. In double sex flowers, such as those of fruit trees, self-fertilization is possible. Nature, however, provides devices and conditions to avoid it. The stigma of some flowers does not become receptive till the anthers on the same blossom have shed their pollen, and therefore pollen from elsewhere has to reach the stigma. Some varieties of fruit, such as the Bartlett pear, cannot produce fruit without the pollen of some other variety. Cucumbers, melons, pumpkins, and similar plants have separate male and female flowers, and in all these instances some agency is necessary to bring the pollen from the anthers of one blossom to the stigma of another. Wind is one of the agents, but the principal ones are insects, and amongst them the most important is the bee. Fertilization by air currents would probably produce barely sufficient fruit to prevent the extinction of the species, but as in the service of man a hen is expected to lay more eggs than she could hatch, and a colony of bees to produce more honey than is sufficient for its needs, so a fruit tree is expected to yield more than sufficient for its propagation, and for the profitable culture of fruits the agency of insects is needed in the fertilization of the bloom.

The honey bee is not only the most important factor in pollination, but the one insect which by structure, the nature of its food requirements and its habits, is best adapted for the purpose. It obtains its food, nectar and pollen from the blossoms of plants. The nectar obtained from

* Paper read at the Annual Conference of Fruitgrowers held at Bendigo, September, 1909.

the blossom under the influence of a secretion from glands in the anatomy of the bee is changed into the honey as found in the combs of the hive. Nature provides the nectar in the flower to attract the bee. To get at the nectar the bee has to pass over the anthers, and the pollen grains adhere to the many hairs covering its body; in visiting the next flower some of this pollen falls on the stigma, and thus fertilizes the blossom, even if the bee is not gathering pollen. In gathering pollen it sweeps together the pollen grains with its moistened tongue, nips it off the tongue with the front pair of legs, passes it on to the second pair of legs, and finally on to the third pair, where it lodges on what is called the pollen basket, a covering of stiff hair below the upper joint. In this performance pollen grains become scattered all over the body of the bee, and as it has to visit many blossoms before it gets the amount it can carry, and passes over the stigma of every flower, pollination is always brought about. If the bee visited the blossoms of different species of plants in the same excursion, there could be no cross fertilization, because strawberry pollen, for instance, could not fertilize peach blossom. It is, however, a well known fact that a bee during each trip confines itself to one species of plant, whether in search of nectar or pollen, and a mixture of pollen is never found in any bee's load as it enters the hive. Plants of the same species, but of different varieties, are, however, worked over on the same trip, and it is largely due to this that seedling fruit trees seldom come true to name, and that there are occasionally crosses of various vegetables.



AN ORCHARD APIARY.

In America, the importance of bees in fertilizing flowers is fully recognised. In the large greenhouses near Boston, where early cucumbers are grown, one or two hives of bees are always inside to pollinate the blossoms, otherwise there would be no cucumbers unless men went round with brushes to carry the pollen from blossom to blossom. At Marengo, in Illinois, lives one of the foremost beekeepers of the United States. All round his apiary great quantities of cucumbers are grown for pickling purposes. They are picked when 2 to 3 inches long, and sold to the pickle factory. To grow

cucumbers profitably, it is necessary that the greatest possible amount of fruit should set on each vine. At the time of my visit there were 600 acres of cucumbers grown in the neighbourhood of the apiary, and while Dr. Miller's bees greatly benefited by the supply of pollen and honey thus provided, the success of cucumber growing is at the same time in a large measure due to the presence of a large apiary.

The fruit-growers of many States, when planting orchards in new and isolated places, found that their orchards yielded unprofitable crops where no bees existed in the locality. When this fact was discovered, and a few colonies of bees were established in or near the orchard, the yields of fruit became normal. Americans specialize in nearly every kind of rural production, and it is a very common practice for a fruit grower to plant a large orchard of one variety only. In the case of at least one variety of pear, the Bartlett or Williams's Bon Chretien, and some varieties of apples and plums, it was found that even when bees were kept these varieties proved barren unless some other variety of the same species existed in or near the orchard, the reason being that the varieties referred to could not be fertilized by their own pollen.

The blossom of the grape vine requires more than many others the agency of insects for pollination. Mr. F. de Castella, Government Viticulturist, informed me a short time ago that, during his recent visit to Europe, he found, in certain districts of Spain, the pollination of grapes, owing to the absence of insects, was done by hand.

I will now give some well-known authorities in support of the statements made. Professor A. J. Cook, formerly of Michigan Agricultural College, and now of Pomona, California, who has paid particular attention to the fertilization of fruit by bees, writing to Mr. Hopkins, Government Apiarist of New Zealand, says:—"Bees never harm blossom, but are always a help. Bees are a tremendous aid through pollination. Many of our best fruits must be cross fertilized to produce. Many pears, apples and plums are utterly sterile to their own pollen. I am sure that it is an incontrovertible fact that bees are the great agents in pollination, and are far more valuable to the world than for the honey they produce."

The best orchardists in California now arrange with apiarists to bring their bees to the orchards; they find they must have the bees. Professor Waite, of the United States Department of Agriculture, covered the blossoms of apples, pears and plums with netting, excluding the bees, and found that the protected blossoms of many varieties yielded no fruit. In some varieties there was no exception to this rule, and he was convinced that large orchards of Bartlett pears, planted distant from other varieties, would be utterly barren were it not for the work of the bees, and even then they could not be profitably grown unless every third or fourth row was planted with Clapp's Favourite or some other variety capable of fertilizing the Bartlett. In other words, the Bartlett pear could no more fertilize its own bloom than the crescent strawberry. Professor V. H. Lowe, of Geneva Experimental Station, New York State, covered a set of small pear trees with hoods of fine gauze, the lower end of the bag-like hood being tied to the trunk of the tree to exclude insects. On all these trees was a large number of buds, and all conditions favourable to a good crop, except that the flight of insects was entirely cut off. The result was that, out of the whole of the trees covered, there was just one fruit, whereas on another set of trees of the same sort not covered, there was a good crop, proportionate to the size of the trees. Many more similar experiments could be given, but I think enough has been said that bees are very necessary to fruit-growing; but of course it is not necessary to keep them in an orchard if there are

bees kept anywhere in the locality to be within reach of a bee's flight, and I think there are not many localities without bees. Still it is, in my opinion, an open question whether in some localities, and under unfavourable conditions of weather, the setting of fruit would not be improved if more bees were kept. In my personal experience, I have always been on the safe side, as I usually have more hives than fruit trees. I have never had occasion to complain of poor setting of fruit; on the contrary, I always have to do a lot of thinning out. While I have shown the great value of bees in the fertilization of fruit, I do not deny that there are some instances of antagonism between fruit-growing and beekeeping. These instances are, on the one side, the spraying of fruit trees with poisonous compounds while the tree is in full bloom, and, on the other side, the damage or apparent damage done by bees to ripe fruit.

In regard to the spraying of fruit trees while in bloom, I am not sure whether the practice is at all general in Victoria. I have heard of only one or two instances of bees being poisoned by spraying, and none have come under my personal observation. The practice of spraying trees in full bloom has been abandoned in America, because not only was it found no more effective than spraying before or after, but it actually reduced the fruit crop by destroying the pollen and the delicate organism of the stigma of the blossom. I am aware that in orchards where varieties are grown which bloom at different periods, it would interfere with straight ahead work to spray the different varieties separately. Still, I would ask orchardists to avoid spraying trees in bloom as far as possible, for the sake of their own interests and for the sake of the industrious insect which is of so much value to horticulture, while it is to the beekeeper his means of living.

Dealing now with the least pleasant item of my paper, that of damage to fruit by bees, it is well known that at intervals of years, corresponding with years of dearth of nectar, bees are accused of damaging ripe fruit. That bees, under stress of circumstances, extract the juice of fruit the skin of which has been broken by birds, insects other than bees, or wet weather I do not deny, but I absolutely deny that bees ever harm sound fruit. Bees will actually starve to death with a bunch of grapes or any other kind of fruit right inside the hive if all other food is out of reach. I do not claim this as a virtue for bees. It is an impossibility for them to puncture fruit. Numerous experiments have proved this fact. When bees gather the juice of damaged fruit it is when no nectar is available, and I have always advised beekeepers to feed their bees near or inside the hive at such times, not so much to keep them away from fruit, but to prevent the fruit juices being gathered and consumed by the bees, as they are quite unsuitable for bee food, and very detrimental to the health of the bees. In my own experience bees have once in a while gathered the juice of grapes and plums which had small round holes pierced through the skin by that mischievous little bird known as the silver eye.

In conclusion, I would again ask you, in performing the operations of your occupation, to bear in mind the value of the bee to your industry, and, in return for the services it renders you, to extend to it a sympathetic consideration, which will at the same time benefit the industry I represent—that of apiculture.

BUILDING HINTS FOR SETTLERS.

III.—FOUR-ROOMED WEATHERBOARD COTTAGE.

A. S. Kenyon, C.E., Engineer for Agriculture.

In consequence of several requests for quantities of material necessary to erect a four-roomed cottage as described in the August issue of the *Journal* (page 504), the complete list is given below.

Red-gum—

8-in. x 2-in. ; 44 8-ft., sole plates.
6-in. x 2-in. ; 4 6-ft., 2 3-ft., tank-bearers and door-steps.
4-in. x 4-in. ; 44 2-ft., stumps.
4-in. x 2-in. ; 4 5-ft., tank-braces.

Hardwood—

9-in. x 1½-in. ; 1 24-ft., ridge.
8-in. x 1½-in. ; 1 4-ft. 6-in., 4 2-ft. 6-in., window-sills
7-in. x 1¼-in. ; 4 13-ft., barge-boards.
6-in. x 1½-in. ; 16 6-ft., tank-stand floor.
5-in. x 1½-in. ; 14 23-ft. ceiling-joists.
4-in. x 4-in ; 4 10-ft., corner studs.
4-in. x 3-in. ; 3 24-ft., 2 23-ft., 3 13-ft., 2 12-ft., 1 10-ft., 1 9-ft., bottom plates and sleepers.
4-in. x 2-in. ; 200-ft. run., 6 24-ft., 14 23-ft., 3 12-ft., 20 10-ft., 4 9-ft., top and vermin plates, floor joists, studs, heads of openings, and horizontal stiffeners.
4-in. x 1½-in. ; 150-ft. run., 60 10-ft., 22 13-ft., 11 12-ft., rafters, collars and studs.
3-in. x 1½-in. ; 10 24-ft., 4 11-ft., 4 6-ft., purlins and weather-board stops.
3-in. x 1-in. ; 100-ft. run., 11 16-ft., 7 11-ft., bracing, &c.
2-in. x 1½-in. ; 100-ft. run., cupboard framing.
2-in. x 1-in. ; 200-ft. run., on outside of stumps.
6-in. x ½-in. ; 3,600 ft. run. weather-boards.

Californian Red Pine—

8-in. x 1½-in. ; 2 4-ft. 6-in., mantelshelf.
8-in. x ⅝-in. ; 16 2-ft., louvres.
6-in. x 1¼-in. ; 50-ft. run., 10 7-ft. 6-in., 5 2-ft. 6-in., 4 2 ft., 11 4-ft. jamb lining, &c.
5-in. x 1¼-in. ; 1 4-ft. 6-in., 4 2-ft. 6-in., window boards.
3-in. x 2-in. ; 4 4-ft. 6-in., 8 3-ft. 6-in., brackets for hoods.
2-in. x ⅜-in. ; 150-ft. run., door and window stops.
Shelving, 12in. x 1 in. ; 6 4-ft. 6-in.
Shelving, 18-in. x 1-in. ; 4 4-ft. 6-in.
Scotia, 1½-in. ; 100-ft. run.
Quarter round, ¾ in. ; 500-ft. run.
Half round, 1-in. ; 100-ft. run.
Sashes, 6 ; 1-ft. 9-in. x 4-ft. x 1½-in., four lights, glazed with 16-oz. glass.
Lining, 6-in. x ⅝-in., T. and G., white ; 2,900-ft. run. if corrugated iron roof be used. (If patent roof felting is used, 1,400-ft. run. extra will be required.)
Flooring, 6-in. x 1⅛-in., T. and G., red ; 1,100-ft. run. (If 4½-in. x ⅞-in. T. and G. hardwood is used, 1,500-ft. run.)

Ironmongery, &c.—

Rim locks, 5 6-in., with brass handles.
Cupboard locks, 2.
Barrel bolts, 3 4-in.
Tee hinges, 5 pairs 18-in., 5 pairs 12-in.
Steel butts, 12 3-in.
Casement fasteners, 5.
Cabin hooks, 6 6-in.
Cup hooks, 48 1½-in., brass.
Ridging, 5 lengths, 26-gauge, 16-in.
Spouting, 10 lengths, 4-in., O.G.
Straps for spouting, 22, stout galvanized iron.
Down pipe, 5 lengths, 3-in. diam., galvanized. iron.
Plain galv. iron, 4 sheets, 72-in x 36-in., 28-gauge, flashing, vent hoods, &c.
Fly wire, 2 sq. yards
Bolts, nuts, and washers, 16 5-in. x ½-in. ; 8 6-in. x ⅜-in.

Wire nails, 1-cwt., 2-in., 21 lbs. 1½ in., 28 3-in., 14 4-in. (If patent roofing felt is used, 7-lb. 1½-in. extra for extra lining.)
Tacks, 4lbs., for hessian
Galvanized iron spring-head nails, 5lb. 2-in. (1lb. only if roofing felt is used.)
Camber bars 2 4-ft x 2-in x ⅜-in., wrought iron.
Colonial oven, 1 3-ft. x 1-ft. 6-in.
Hessian, 62-yds., 72 in. wide.
Tar, 5 gallons, for damp-course.
Galvanized Corrugated Iron, 24-gauge, 52 7-ft. (If patent roofing felt is used no corrugated iron needed, but 3¼ rolls of felt with caps, cement, and nails for fixing).
Tank, one 1,000-gallon corrugated galvanized iron tank, with cover, tap, overflow, &c., complete).
Bricks, 2,800.
Cement, 2 casks.
Sand, 2 cubic yards.

It would be a great improvement to the cottage and but little extra cost for the eaves to project about 1 foot. This would mean using 26 7-ft. and 26 8-ft. sheets of iron instead of 52 7-ft., and 22 14-ft. rafters instead of 22 13-ft. If roofing felt is used in place of iron, 3½ rolls will be needed instead of 3¼ rolls, and 100 running feet more lining. In each case the barge boards will be 14 feet instead of 13 feet.

IRISH POTATO BLIGHT AND ITS TREATMENT.

D. McAlpine, Vegetable Pathologist.

The discovery of Irish Potato Blight in the different States of the Commonwealth renders it necessary to point out, without delay, the various precautions to be taken in dealing with this disease, in order to prevent or limit its spread, as well as to eradicate it, if possible. The first step to be taken is evidently that of isolating the affected districts, by proclaiming them infected areas, so that no potatoes growing in such districts shall be allowed to contaminate healthy potatoes, or to be used for seed.

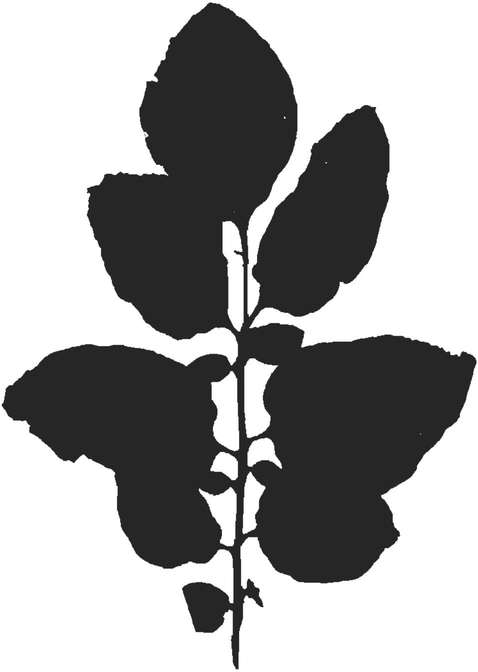
But the disease may be present in other districts at present unsuspected, and in order to keep presumably clean districts free, certain measures may be adopted. Since the disease is due to a microscopic fungus, whose life-history is fairly well known, and described in *Bulletin* No. 27, it can only be definitely determined by an appeal to the microscope. But there are certain symptoms which indicate its presence, and may be taken as presumptive evidence of its existence. If the leaves show brown spots, which are surrounded by a delicate mould on the under surface, so that ultimately the leaves and stems blacken and decay, the fungus is probably that of Irish Blight. The leaves, however, may simply turn brown and shrivel up, and yet the tubers may be affected. The surface of the potato may be sunken in patches and brown underneath, as a preliminary stage, and this may be followed by putrefactive organisms, which render the entire tuber rotten, and cause it to give forth an offensive smell.

Principal Means of Prevention.

There are at least three principal means whereby the fungus may be either prevented from gaining a footing, or kept in check—

1. As the fungus was first imported into Australia by means of seed potatoes, brought from countries where the disease already existed, the living spawn of the fungus being latent in the tubers, it is evident that if only clean seed be used, free from the fungus, there will be no development of the disease.

2. As the spores of the fungus, which are equivalent, as far as reproduction is concerned, to the seeds of higher plants, may sometimes occur on the surface of the tubers, it may be necessary to disinfect them.



POTATO LEAF (UNDER SURFACE) SHOWING EARLY STAGE OF DISEASE.

3. As the fungus causing the disease is produced from spores, if these spores, falling on the leaves of healthy plants are prevented from germinating there, or if the spores falling on the soil are prevented from reaching the tubers, then the disease would be nipped in the bud.

If the spores have once germinated and infected the potato plant by reaching the interior, then there are no means known of dealing with it. It is prevention, and not cure, which is attempted.

Disease-proof potatoes are also sometimes placed upon the market, but while some varieties are less susceptible to the disease than others for a

time, none are known to withstand it altogether. The most promising field lies in raising new varieties from seed, and Mr. Seymour, the Potato Expert, is at present engaged in this work.

Treatment of Seed Potatoes.

1. To secure seed free from the living fungus in its interior is not always easy, from the difficulty of detecting it in some cases; but the difficulty may be overcome to a certain extent if the following precautions are taken:—

(*a*) Seed potatoes should only be planted when obtained from a district known to be free from Irish Blight. In older countries, where the disease has become established, this is almost impossible, but here in Australia there are, fortunately, districts still free, and where the fungus is not likely to thrive.

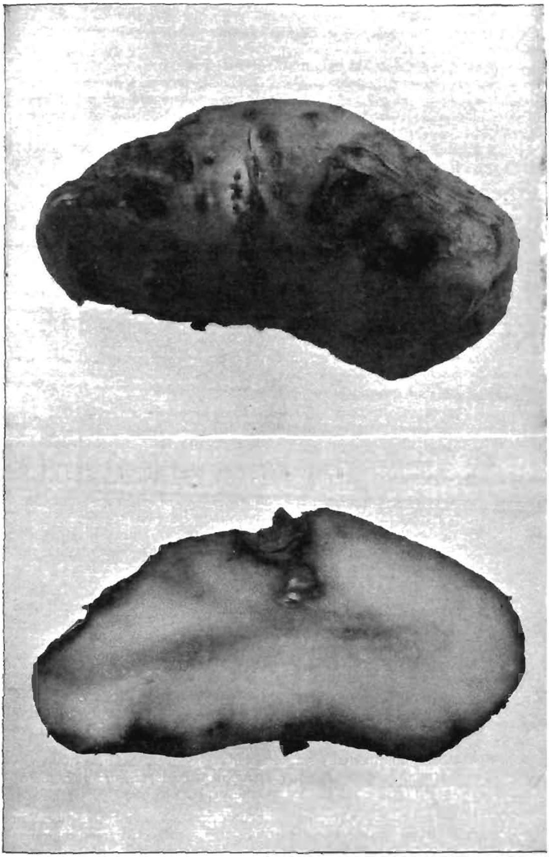
(*b*) If the seed tubers are suspected, or, in order to make certain that the fungus is destroyed, they may be sterilized. The ordinary sterilizing of the surface will not serve the purpose, for the fungus is inside the potato; but Jensen has devised an effective method of treatment. This consists in subjecting the seed potatoes to a dry heat at a temperature of 120 degrees Fahr., not allowing it to fall below 118 degrees Fahr., nor to rise above 132 degrees Fahr. I had some diseased potatoes kept at a temperature of 110 degrees Fahr. for four hours, but afterwards they produced a luxuriant crop of the fungus in 24 hours, while at 120 degrees Fahr. the spawn of the fungus was destroyed. I have had an apparatus constructed, consisting of a copper cylinder, with a movable basket inside capable of containing a bushel of potatoes, and surrounded by a jacket of water, kept, when necessary, at the proper temperature. After this treatment the germinating power of the tubers is rather improved than otherwise.

2. If the seed potatoes were certainly obtained from a clean district there would be no necessity for treatment for this disease, but with the possibility that they may have come from an infected area, or have been in contact with diseased tubers, it would be a wise precaution to disinfect the seed. No one, of course, would think of planting badly-rotted potatoes, but those that are but slightly affected may escape notice, and, even if detected and rejected, they might still be a source of danger. I have received potatoes, both from Tasmania and South Australia, in a box, with the living fungus freely producing its spores upon them, and the mere handling of such specimens might be the means of transmitting the disease to clean seed.

Seed potatoes may be simply disinfected by placing them in a loose bag and then steeping them in a solution of formalin for two hours. A 1-lb. bottle of the proper strength may be obtained from Messrs. Cuming, Smith, and Company, Melbourne, at a cost of 1s. 6d., and this has to be added to 32 gallons of water, and, after stirring, it is ready for use.

Spraying.

To prevent the spread of this fungus from plant to plant by means of spores, there is the well-tested and successful method of spraying. It may be almost completely controlled by the use of Bordeaux mixture, which is now recognised as the most effective fungicide, and a short account of how to prepare and use it is here given. In the orchard this mixture



SURFACE VIEW AND SECTION OF DISEASED TUBER.

is constantly used for the treatment of Black Spot of the apple and pear, and other diseases of fungus origin, and the same preparation is suitable for the Potato disease. Spraying is recommended not only for Irish or Late Blight, but also for other diseases, such as Early Blight, which is common in some districts in certain seasons, and, since Paris green may be added to the mixture, it may be used as a combined insecticide and fungicide. It is generally found that spraying increases the yield, even in the absence of Irish Blight, and that it will pay to spray as a regular operation.

(*a*) Bordeaux mixture consists of bluestone or copper sulphate and lime. Fresh quicklime is necessary, and the copper sulphate should be procured in the form of the blue crystals. A convenient formula to use is—

Bluestone	6 lbs.
Quicklime	4 ,,
Water	50 gallons.

The bluestone is dissolved in a barrel or wooden tub, and made up to 25 gallons. The quicklime is slaked, and, when in the form of a fine powder, 25 gallons of water are added to form milk of lime. The bluestone solution and milk of lime are poured evenly together into a third barrel or direct into the spray-pump, and after being thoroughly agitated the mixture is ready for use.

(*b*) A form of Bordeaux may be used in which lime-water takes the place of the milk of lime. Less bluestone is necessary, and the solution is equally efficacious. The formula is—

Bluestone	3 lbs. 2 ozs.
Lime-water	$42\frac{1}{2}$ gallons.
Water to make up to	50 ,,

The lime-water may be prepared by placing the quicklime ($2\frac{1}{2}$ lbs.) in a gunny bag (or any bag of loose texture will do) and suspending it in the proper quantity of water in the morning, and next morning it will be ready for use. It may be run off into the bluestone solution, and after thorough mixing it is ready for spraying.

(*c*) There is also the Copper-soda solution which may be used, and consists of—

Bluestone	6 lbs.
Washing soda	7 ,,
Water	50 gallons.

The bluestone is dissolved as before, and also the washing soda, and then poured into a third vessel and intimately mixed. The potato plant should be sprayed when 6 to 8 inches high, and again when in bloom; but if the season is moist, intermediate sprayings may be given at intervals of a fortnight. A quarter of a pound of Paris green added to the 50 gallons serves to destroy the grubs as well.

(*d*) To prevent the spores, even when formed, reaching the tubers in the soil, a process of earthing-up or protective moulding has been recommended by Jensen. He found that the soil acted as a sort of filter, and prevented the passage of the spores,

so that if the earth is banked up about the stems and the topmost tubers covered to a depth of about 4 inches, they will escape. While there is less liability to disease under these conditions, it is found that there is a lessened yield, so that this method has not been largely availed of.

The presence of Irish Blight in our midst should have the effect of directing attention to the necessity for more intelligent and more effective cultivation and clean working of the potato, since other solanaceous plants, including the tomato, may harbor the fungus. The seed should be carefully selected and properly stored, and spraying should become one of the regular operations of the farm. The manurial requirements of the plant should also be attended to, and the fact recognised that potash in a readily available form is essential to the healthy growth of the potato.

Recommendations.

In order to prevent the introduction of the disease into districts already free from it, the following recommendations are made:—

Only clean seed should be planted, obtained from districts where Irish Blight is not known to exist, and all seed potatoes should be carried in new bags.

Since the seed may appear sound, and yet harbor the disease on the surface, it should be disinfected by means of formalin solution, with or without previous washing.

Cut seed should be used, because it is the only sure method of detecting blemishes, and any seed not absolutely clean on cutting should be boiled or burned.

A system of rotation should be adopted, whereby potatoes would not be planted in the same ground oftener than once in four years.

Spraying with Bordeaux mixture or copper soda should be carried out when the plants are about 6 inches high, particularly if the growing season is a moist one, and again when they are in bloom, but intermediate sprayings may be necessary at intervals of a fortnight. As a rule, three sprayings are all that are necessary, if the first one is given early enough.

ARTIFICIAL MANURES.

Notice to Manufacturers and Importers.

It is requested that all manufacturers and importers of artificial manures shall submit to the Chemist for Agriculture, Public Offices, Melbourne, prior to 30th November, samples of all fertilizers which they intend to sell under the provisions of the Artificial Manures Acts 1904 and 1905 during the coming season.

LEONGATHA LABOUR COLONY.

Trustees' Annual Report and Balance Sheet, 1908-9.

Trustees.—E. J. Nevell (Chairman), T. Cherry, M.D., M.S., P. J. Carroll, J. H. Mullaly, and J. R. Pescott.

During the year ended 30th June, 1909, 482 men have made application to be sent to the Labour Colony. Of this number, 292 were admitted, making a total number of applications since the colony was opened in 1893 of 10,782, and the actual number admitted 7,232. On the 30th June, 1908, there were 65 men on the establishment, so that, with the 292 new arrivals during the year, 357 have been dealt with during the twelve months under review. Of these, 65 left without giving any notice, 105 for positions found for them by the farm manager, 91 to look for work, with sufficient money earned on the colony to carry them along while seeking more remunerative employment, whilst 21 were discharged for various offences, and 8 were sent to Melbourne for medical treatment, leaving 67 still on the books at the end of the year. The average number of colonists was 64.2, and the average period per individual 9½ weeks.

The cost of maintenance, including food, wages, and management, has been 8s. 2d. per week per man, the cost of food alone being 3s. 10d. per week per man.

Owing to the existence of the colony no deserving man need starve in the city. Applications for admission are made every week by the destitute unemployed, and not a single week has gone by without some having been sent. Naturally, there are more applications in the winter than in the summer, and evidences are continually being brought under notice as to the value of the institution to destitute starving men. Independently of the men who have been sent to the colony, private employment for 51 men has been found, through the agency of the Charity Organization Society and private individuals.

It will be seen by the accompanying list that, out of the 482 men who applied, 48 different occupations were represented. This will show how difficult it is for the manager to put them to profitable work. Their physical condition, also, is such that, in the majority of cases, they can be given light work only, but many go to the colony with the expressed desire to learn something about agriculture. The occupations, ages, and religious denominations are as follow:—

Occupations.

Labourer	163
Milker	65
Carpenter	27
Cook	25
Gardener	22
Groom	15
Farm hand, clerk (13 of each)	26
Ploughman, useful (11 of each)	22
Draper, bootmaker (10 of each)	20
Butcher	7
Seamen, ironmoulder, painter, printer (5 of each)	20
Blacksmith, miner, sailor, kitchenman, tailor, baker, waiter, and bookbinder (4 of each)	32
Bushman, fireman, driver, and solicitor (3 of each)	12
Engine-fitter, engine-driver, grocer, tinsmith, sawyer, and plasterer (2 of each)	12
Joiner, teacher, accountant, wheelwright, canvasser, pastry-cook, shoeing-smith, French polisher, station hand, shipwright, confectioner, donkey-man, tentmaker, and civil engineer (1 of each)	14
	482

Ages.

Under 30 years of age	...	79
Between 30 and 40 years	...	159
Between 40 and 50 years	...	174
Over 50 years ...	...	70
		482

Religious Denominations.

Roman Catholic	...	...	188
Church of England	...	...	181
Presbyterian	..	.	67
Methodist	..	. ...	30
Baptist	...	.	4
Lutheran	... ...	..	4
Independent	.	.	3
Spiritualist	.. .	.	2
Jews ...	.. ..	..	2
Freethinker	... ...	.	1
			482

Since the present trustees were appointed the revenue has gradually increased. The following figures show the gross takings from the colony from 1904-5 to 1908-9:—

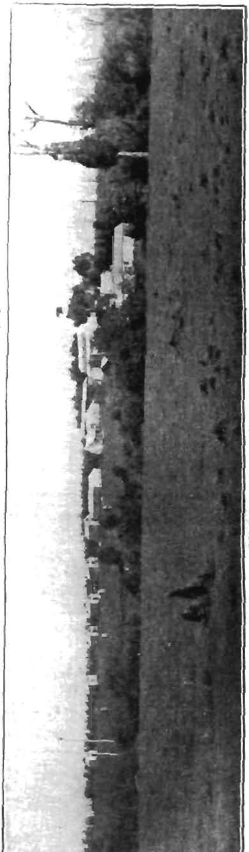
			£	s.	d.
1904-5	...	...	1,266	2	1
1905-6	...	...	1,172	4	8
1906-7	...	...	1,382	18	3
1907-8	...	...	1,408	3	10
1908-9	...	...	1,847	0	4

The payments have been about the same, with the exception of this year, when, owing to the building of the new piggery, &c., and the extra number of men, the expenditure has been about £600 above the average. Of the amount expended, £775 was disbursed by the trustees in Leongatha, independently of £400 paid in wages to the colonists, who spend about half that amount locally.

The following are particulars of some of the individual sources of revenue:—

Pigs.—During the year the sales amounted to £495 16s. 10d., an increase of £175 over last year, whilst the stock on hand is valued at £336 as against £165.

Dairy Herd.—Owing to the reduction of the original area the stock has been culled down to the value of £721, as against £810 last year, but the revenue from the herd has decreased by £20 only.



GENERAL VIEW OF HOMESTEAD.

Horses.—There have been a few changes in our stock of horses, and their value now stands at £321 as against £309 for last year.

Garden and Nursery.—The receipts from this branch were £236, exclusive of the fruit and vegetables consumed on the premises. A shipment of 300 cases of apples sent to Liverpool averaged 9s. 6d. per case, which is considerably more than would have been received in the Melbourne market. Last year, over 1,000 cases were picked, and this year a greater quantity and a better class of fruit is anticipated.

Colonists' Board and Lodging.—During the year there has been a great demand for colonists by the local farmers. The men working in the district and boarding at the colony have paid £161 for board and lodging as against £16 in 1904; £17, 1905-6; £49, 1906-7; and £30, 1907-8. As over 400 additional acres of onions are being planted in the district, it is anticipated that a greater number of our men will be required for the onion and potato crops this season than last.

COLONISTS CUTTING FIREWOOD.

During the year £274 15s. 9d. was deducted from the cheques given to the colonists for goods supplied to them whilst at the colony. If this amount be added to the revenue the total would be £2,121 16s. 1d.

The following goods were sold to the colonists:—

	£	s.	d.
Tobacco	83	17	4
Stores	17	9	1
Stamps	1	13	9
Boots and clothing	31	16	11
Board and lodging	111	9	0
Railway tickets	28	9	8
	£274	15	9

On the expenditure side of the ledger it will be seen that the trustees spent certain moneys to bring the colony up-to-date, for example, £121

for pigs, some pure-bred Yorkshire pigs having been bought to replace the old sows. The result has been very satisfactory as there have been continual demands for the young stock—a number of weaners having realized £3 3s. each for stud purposes. In removing the old pigstyes and building the present up-to-date piggery, £165 for new material was expended.

On account of the increased weekly average number of men, 64.2 as against 47.7 of last year, the food account went up; but, when it is remembered that the men are given three good meals per day at a cost of 3s. 10d. per week per man, the increase is fully explained. It will thus be seen that by judicious management every item of economy is studied without reducing the ration.

Taking the items on the general balance-sheet it will be seen that since the trustees were appointed (1905) a Government grant of £500 per year has been received, whilst the total grant for the first four years of the colony's existence was £12,107 10s. 7d.; for the first year it was

COLONISTS HOEING BEANS.

£4,813 15s. 2d., with £614 10s. 1d. from public subscription. The original area of the colony was 822 acres, valued at £25 per acre with improvements, but from time to time it has been reduced and now consists of 420 acres. Each year, 5 per cent. for depreciation on buildings has been written off, the valuation now standing at £1,864.

In the profit and loss account it will be noticed that a loss of £352 for the year is shown, whilst for 1907-8 it was £594, and for 1906-7, £830. It will thus be seen that the goal of self-support is in sight. For the last three years the total loss was £1,776, whilst for the previous ten years it amounted to £15,031.

The farm manager (Mr. J. J. Willoughby), gardener (Mr. A. P. Prout), bookkeeper, (Mr. A. I. Spinks), and dairyman (Mr. A. Deveson) continue to work with zeal and intelligence. The trustees are also indebted to Mr. W. H. Crate, secretary, for the valued and loyal assistance he has at all times displayed in the performance of his duties.

LEONGATHA LABOU

RECEIPTS AND PAYMENTS FOR TWELV

RECEIPTS.

	£ s. d.	£ s.
Bank Balances—		
Trust Account	694 13 4	
Wages Account	8 5 10	
		702 19
Paid at Treasury out of Vote for Labour Colony ..	.. ..	543 19
Live Stock—		
Bees	7 7 6	
Poultry	0 3 6	
Pigs	495 16 10	
Sheep	99 5 10	
Cattle	18 0 8	
Dairy Herd	9 10 0	
Horses	76 0 0	
Dairy	497 15 0	
Nursery	236 2 4	
Farm Produce	33 18 10	
Colonists' Board and Lodging	161 5 5	
Food, Sale of Hides, &c.	58 14 11	
Wages, Agricultural Department	124 1 5	
Rent	2 7 6	
Boots and Clothing	10 1 3	
Prizes, Leongatha Agricultural Show	5 5 0	
Miscellaneous Receipts	11 4 4	
		1,847 0

	£ s. d.
Sales to Colonists—	
Tobacco	83 17 4
Stores	17 4 7
Stamps	1 13 9
Boots and Clothing ..	33 11 6
Board and Lodging ..	111 9 0
Railway Fares ..	28 9 8
	£276 5 10

£3,093 19

COLONY.

MONTHS ENDED 30TH JUNE, 1909.

PAYMENTS.

	£ s. d.	£ s. d.
Stores	290 12 1	
Plant and Tools	8 17 10	
Bedding	34 14 0	
Farm Produce	188 18 6	
Boots and Clothing	53 16 10	
Food	319 17 8	
Tobacco	79 14 8	
Insurance	40 14 6	
Furniture	7 12 8	
Manure	53 11 3	
Dairy	46 10 9	
Maintenance of Plant	65 2 8	
General Expenses	65 14 5	
Building Materials	163 14 5	
Railway Freights	103 5 11	
Railway Fares	129 7 0	
Nursery	84 16 2	
Wages	439 11 8	
Salaries	473 15 0	
Stamps	4 3 2	
Printing and Stationery	2 16 0	
Water Service	8 18 6	
		2,666 5 8
Live Stock—		
Pigs	121 5 6	
Horses	40 2 6	
Dairy Herd	50 0 0	
		211 8 0
		2,877 13 8
Less Discounts Allowed		24 6 9
		2,853 6 11
Bank Balances—		
Trust Account	219 19 9	
Wages Account	20 12 7	
		240 12 4
		£3,093 19 3

E. J. NEVELL, Chairman,
Leongatha Labour Colony.

LEONGATHA LABOUR

BALANCE-SHEET

LIABILITIES

	£	s.	d.	£	s.	d.	£	s.	d.
Advanced by Government—									
1893–4				4,213	15	2			
1894–5				3,203	8	0			
1895–6				2,473	13	1			
1896–7				2,219	14	4			
1897–8				2,729	13	2			
1898–9				4,091	8	1			
1899–1900				3,884	5	11			
1900–1				3,000	0	0			
1901–2				2,374	3	6			
1902–3				3,627	7	10			
1903–4				1,998	18	11			
1904–5				999	19	7			
1905–6				499	19	9			
1906–7				499	19	10			
1907–8				449	18	7			
1908–9				549	19	9			
				£36,816	5	6			
Less value of 391 acres 1 rood 6 perches, land included in original Colony, and improved by Colony Funds, now *resumed by Lands Department*, as per valuation, £13 6s. 6d. per acre . .	5,219	13	7						
Less original value, £1 per acre . .	391	5	7						
				4,828	8	0			
				£31,987	17	6			
Public Subscriptions, 1893–4				614	10	1			
							32,602	7	7
Sundry Creditors							131	5	2
							£32,733	12	9

COLONY.

30th JUNE, 1909.

ASSETS.

	£ s. d.	£ s. d.	£ s. d.
Bank Balances—			
Trust Account		219 19 9	
Wages Account		20 12 7	
			240 12 4
Colonists' Ledger Account, being Amount owing by Colonists and Ex-Colonists		..	82 18 4
Stock in Hand—		£ s. d.	
Dairy Herd		721 5 0	
Pigs		336 5 0	
Sheep		4 10 0	
Horses		321 0 0	
Poultry		7 16 3	
Water Service		126 15 0	
Stores		93 0 4	
Growing Crops		155 10 0	
Nursery		69 19 9	
Printing and Stationery		1 7 2	
Harness		49 12 3	
Implements		357 19 9	
Bedding		61 17 6	
Food		17 16 8	
Building Materials		8 9 0	
Manure		16 18 0	
Furniture		95 13 4	
Tobacco		2 13 2	
Fodder, Seed, &c.		333 16 9	
Plant and Tools		395 0 4	
Dairy		4 3 5	
Boots and Clothing		4 11 5	
Stamps		2 5 6	
			3,188 5 7
Buildings	£ s. d.	1,520 0 0	
Less Buildings pulled down and removed	183 0 0		
Less 5 per cent. Depreciation ..	67 0 0		
		250 0 0	
		1,270 0 0	
Add New Buildings, Pig-styes, Yards, Sheds, and Alterations		594 0 0	
			1,864 0 0
Land—422 acres, at £25 per acre		.. ..	10,550 0 0
Profit and Loss—			
Balance Forward		16,454 8 10	
Add Loss on Transactions for 1908–9		353 7 8	
			16,807 16 6
			£32,733 12 9

E. J. NEVELL, Chairman,
Leongatha Labour Colony.

Audited and found correct—

J. T. R. DALTON.
E. R. MOUNTJOY.
18.8.09.

Profit and Loss Account—Year 1908-9.

	Cr. £	s.	d.
Growing crops	70	16	0
Irrigation Plant	16	11	0
Board and lodging	111	9	0
Cattle	13	0	8
Horses	48	4	6
Pigs	545	2	4
Poultry	4	12	9
Furniture	2	17	5
Rent	3	17	6
Dairy	459	18	10
Nursery	223	0	3
Harness	7	7	3
Discount	24	6	9
	£1,531	4	3

	Dr. £	s.	d.
Garnered crops	52	9	3
Bedding	10	10	6
Tobacco	2	17	10
Stores	233	18	2
Boots and clothing	10	3	8
Railway fares	90	14	4
Dairy herd	124	13	0
Sheep	29	2	2
Building materials	163	14	11
Plant and tools	25	3	9
Manure	73	7	9
Fodder, Seeds, &c.,	3	11	1
Food	268	2	10
Railway freights	96	2	1
Printing and stationery	4	5	1
Maintenance	72	10	5
General Expenses	73	8	6
Wages	380	17	1
Salaries	472	5	0
Insurance	40	14	6
	£2,228	11	11

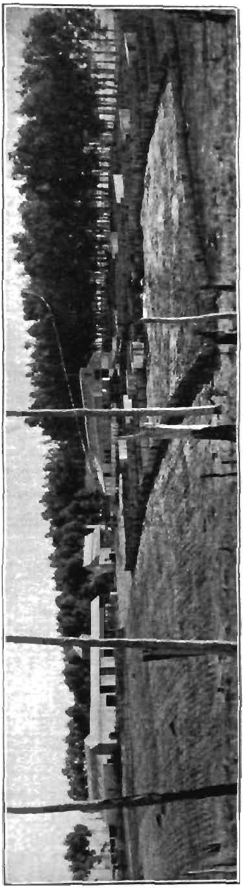
Value of Stock on hand 30th June, 1909.

	£	s.	d.
Dairy herd	721	5	0
Pigs	336	5	0
Sheep	4	10	0
Horses	321	0	0
Poultry	7	16	3
Water service	126	15	0
Stores	93	0	4
Growing crops	155	10	0
Nursery	69	19	9
Printing and stationery	1	7	2
Harness	49	12	3
Implements	357	19	9
Bedding	61	17	6
Food	17	16	8
Building materials	8	9	0
Manure	16	18	0
Furniture	95	13	4
Tobacco	2	13	2
Fodder, seeds, &c.,	333	16	9
Plant and tools	395	0	4
Dairy	4	3	5
Boots and clothing	4	11	5
Stamps	2	5	6
	£3,188	5	7

FARM MANAGER'S REPORT.

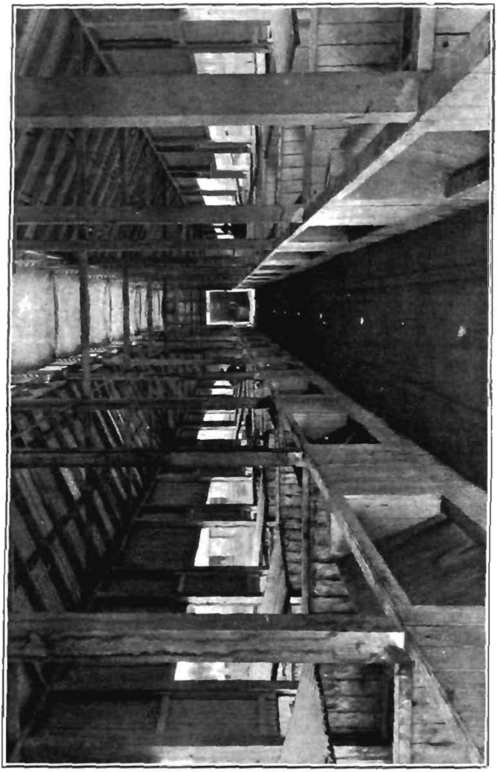
During the year the old horse-paddock (5 acres) was grubbed, and all wood therefrom cut up for firewood; afterwards it was planted with potatoes. Portion of the flat in the old pig paddock was cleared and the stumps charred out. All timber lying on the ground in No. 9 paddock is being cut up for firewood. Ferns have been cut three times during the year and used as bedding for horses and pigs. All fences and gates have been repaired, and new gates made; 15 chains of new fencing have been erected, and 30 chains of old have been shifted.

The old pigstyes have been removed and a new piggery erected. The building is 120 feet by 30 feet wide, exclusive of exercise yards (5 feet) running the full length of both sides of the building. The site, filled to a level within a brick casing, is floored with brick, grouted in. Down the centre, between the rows of pens, runs the tram track for the conveyance of food from the feed house at the top end. The pens on each side have been constructed to a uniform size, viz., 10 feet x 12 feet, and each opens out into its own exercise yard of 5 feet x 12 feet. In the sleeping space, a movable false floor of battens has been introduced, raised 2 inches above the floor proper, which has a slope of six inches to the rear by 4 inches to the further side, so that cleansing operations by means of a hose is a matter of greatest ease, as the water is laid on throughout.



GENERAL VIEW OF PIGGERY AND YARDS.

Following the natural fall from the pens the drainage passes to the general drain which is outside the exercise yards. The general



INTERIOR OF NEW PIGGERY.

drain is 2 feet 6 inches wide and shallow, and traverses the full length of the building. The drainage is then carried to the pit two chains

away, from whence the manure is conveyed to the paddocks for fertilizing purposes. These main drains also take the place of races along which the animals may be travelled to the various pens, or from thence to the market cart.

Moulded concrete, with a plugged outlet for cleansing purposes, provides a cheap and indestructible trough. A swinging door that swings from the bottom inwardly keeps the animal from the troughs while the food is being placed therein. In addition, an upward sliding door is placed to allow access to the exercise yards, the remainder of the outward wall of each pen being pivoted at the sides, so as to be swung open when necessary for the admission of air and sunlight. The building is crowned with a lantern roof with alternate louvre and glass, providing both light and ventilation.

On the sloping ground adjoining there are 20 yards for the breeding sows, each yard being $1\frac{1}{2}$ chains long by $\frac{1}{2}$ chain wide with an open shelter shed with its back to the prevailing winds. After supplying the wants of the animals under cover the feed trolly with its load may continue its course down the hill between these yards, thus reducing the carrying of feed to a minimum. In addition, five 3-acre paddocks have been fenced off and shelter sheds have been constructed for the breeding sows.

The cottage in No. 9 paddock has been pulled down and converted into a feed room, 50 feet x 30 feet, at the north end of the piggery. The ground was excavated to a depth of 3 feet at one end so as to bring the floor level. The milk tank on wheels with its load of milk can be pulled alongside the building and the milk flow turned direct into the vats inside the building, thus saving time and labour. Three 80-gallon coppers have been built in to cook the feed for the pigs, and these can

SOME OF THE BROOD SOWS.

be emptied straight into the feed trolly. Ample room has been allowed for milk vats, bedding, potatoes, and other fodder.

The cost of the buildings, yards, &c. (not including old material) was about £283. The work was carried out entirely by colonists, no outside labour being employed. Further alterations to the yards and surroundings to make them perfect have yet to be made. The styes will hold 120 pigs, and will be used for fattening purposes, the sows being kept in the yards. A small hut for the pig attendants has been built, and a metal road made from the dairy to the piggery.

OATS, PEAS, AND BEANS FOR SILAGE.

The following crops were grown during the year :—

Wheat and oats for hay (2½ tons per acre)	47	Acres.
Peas (20 bushels per acre)	15	,,
Oats, peas, and beans for green stuff and silage (4½ tons per acre)	23½	,,
Tick beans (30 bushels per acre)	4	,,
Maize (8½ tons per acre, grown on hillside)	24	,,
Potatoes (4 tons per acre)	20½	,,
Mangolds (25 tons per acre)	4	,,
Lucerne (sown in drills in November, fed down twice)	0¼	acre.
Orchard and garden	18	acres.
Total	156¼	acres.

Excellent silage to the extent of 210 tons was made from the oats, peas, and beans. This, when analyzed, gave the following result :—

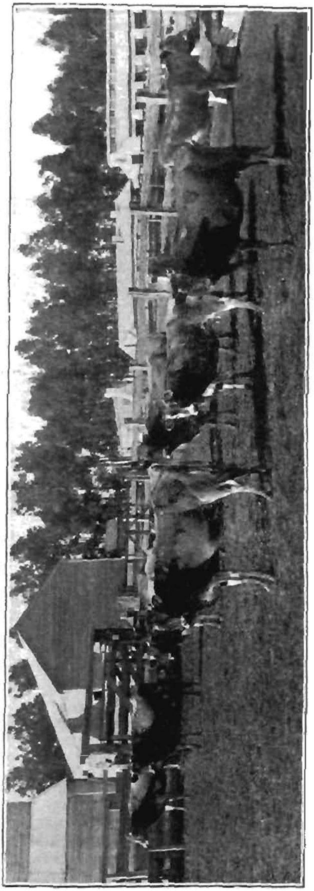
	Samples as received. per cent.	Calculated on dry basis. per cent
Moisture	32.20	—
Ash	4.40	6.48
Total proteids	9.22	13.60
Crude fibre	18.35	27.08
Nitrogen free extract	33.43	49.30
Ether extract	2.40	3.53

The silage was exhibited at the local Agricultural Show, and was awarded first prize.

The potatoes turned out well; Brown's River in good ground yielded 5 tons to the acre, Snow-flake and White Elephant, grown for pig feed, were put in late in January, and are returning 3 tons to the acre. Mangolds did very well; lucerne, sown for experiment, is doing fairly. Ample provision is being made for plenty of feed for the coming year.

Most of the cocksfoot grass on the farm pastures was eaten out last year by the Take-all grub; a large portion was resown with cocksfoot, rye, trefoil, and clover. With the exception of the trefoil, all the seed came up well, and the pasture is in fair order. The Take-all grub has done a little damage this year. An endeavour will be made during the coming year to get flats drained, and this will greatly improve them.

Cattle.—The cattle are in splendid order. The average number of cows milked for the year was 51, the returns for cream alone being £479 9s. 5d. On account of shortage of feed last winter half the cows were out grazing on the plains at a cost of £35 and returned in low condition. The amount of butter fat was 10,186 lbs. as against 9,275½ lbs. last year. Although the prices were good the ruling rates were lower than in the previous years.



SOME OF THE JERSEY HERD.

The stock are well looked after by the dairyman, and have been fed on silage. The silage (oats, peas, and beans) formed a balanced ration, and during the period in which it was fed to the cows the butter fat increased 1½ lbs. per cow for the fortnight. When it was finished the cows were then fed on maize silage, and the butter fat decreased 1¾ lbs. per cow for the same period. The former gave such good results that 17 acres of the same mixture have been sown this year, and should yield 80 tons, and be ready to feed to the cows at the latter end of December.

The milk is weighed daily and tested once a month, and records kept. For the year the lowest test of the bulk milk was 4.2 in October, the average being 4.5. Amongst the herd are some very good Jerseys, and during the year a pure Jersey bull of undoubted dairy quality was bought. At the local show the Jerseys were awarded 1st and 2nd prizes in the aged cows, and 1st and 2nd in the two-year class. Only a few of the crossbred Holsteins have been milked, but they have done well. The best one gave 501½ gallons of milk with a 4.2 test (average) for the year.

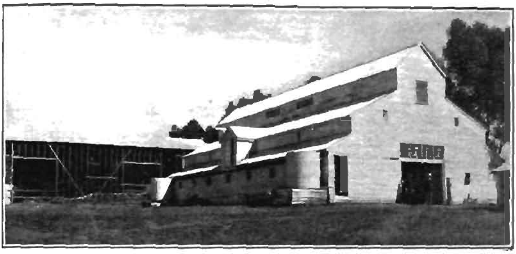
INTERIOR OF MILKING SHED.

The cattle now on the property are as follow:—

Dairy cows	79
Dairy heifers, 2 years old	27
Heifer calves	8
Bulls	4
Commercial cattle	4

Horses.—There are thirteen on the farm, including a fine eighteen-months' old filly. They are all in splendid condition, and three of the draught mares are due to foal this season. The horses are fed on chaff grown on the colony, and their condition speaks for its quality.

Pigs.—The demand for pigs has been very good and the prices high. The sales for the year amounted to £495 9s. 10d., and the value of those killed for consumption on the farm £15. Stores were bought on account of some of the sows missing. Seven Yorkshire sows and one



STABLES AND BARN.

Yorkshire boar for breeding purposes were also purchased, and of their progeny five sows and one boar have already been sold, and several orders have been booked.

BROOD MARES.

I have been crossing the Yorkshire boar with the Berkshire sow, and the result is a fine thick stocky pig—in the majority of cases white in colour, and weighing 80 lbs. at six weeks. From experience this year it is proved that in selling a black or white pig of even weight, the latter will bring 5s. more than the black every time. The brood sows (42) on hand are all in pig, and have started to farrow.

Provision is being made to grow as much feed as possible for the pigs so as to save buying; 30 acres of peas, and 12 acres barley are being put in, and later on 15 acres of potatoes will be planted. The amount paid for pig feed for the year was £65 14s. 1d., *i.e.*, butter milk £32 7s. 6d., barley and pea meal £33 6s. 7d. The rest was grown

on the colony and charged to the pig account. Far greater returns are anticipated from this industry during the coming year as the new piggery is now completed, and the pigs can be given better attention.

At the close the stock consisted of the following:—

Crossbred breeding sows	34
Pedigree Yorkshire sows	8
Porkers	30
Stores	80
Suckers	19
Yorkshire boars	2
Berkshire boars	1
Total	174

Beef.—The beef is all slaughtered on the colony. Early in the year cattle were dear, but I have managed to buy at average cost of 14s. 2d. per 100 lbs. (general average).

Colonists.—The colonists on the average have been a very fair lot of men who do a reasonable amount of work in a day. When first taking charge, thirteen months ago, I found that nearly every colonist's aim was to do as little as possible, and to stop others from working if inclined to do so, and these men were the biggest fault-finders on the place. I told them that they were expected to do a fair thing, and they would be treated likewise. This policy I have endeavoured to follow out. If a colonist does fair work his wages are raised; those who do not, get no rise, and those found loafing dismissed, with the understanding that they will not be taken back. A large number come back regularly to the colony and acknowledge its benefits to them. Only in one instance have I had abusive language from a colonist. Their conduct is very good, and they are easily managed if taken properly and quietly, firmness at all times being necessary. A few come who are physically incapable of work, and these are given as light work as possible. As far as possible, men are put on work most suitable to them and profitable to us. If a colonist desires to learn any particular work, he is put at it and taught. A practice is always made never to send a lazy man to outside employment. The colonists know this, and therefore work better. I have secured the confidence of local employers by sending them good men, and the result is far more employment for the men at better wages.

During the year we have had numerous visitors from various parts of the world, besides farmers from the surrounding districts. Information has been supplied on dairying, pigs, and silage, with good results. Several officers from the Agricultural and Lands Departments have visited the colony, and I am always pleased to see and confer with them.

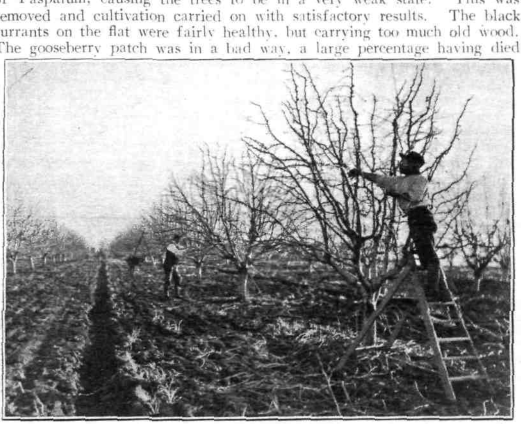
Rainfall for the Year 1908-9.

1908.	
July	2.92
August	3.20
September	3.57
October	2.57
November	1.70
December	6.64
1909.	
January	2.71
February	1.28
March	1.02
April	3.69
May	2.87
June	5.65
	32.72

GARDENER'S REPORT.

Orchard.—On taking charge of the orchard I found the trees generally in a fairly healthy state, but in an ill-pruned condition, being far too thick and carrying about half as many branches again as is necessary in a well-pruned tree. This entailed a lot of work thinning out, which was done with good results.

Two blocks of orchard had been used as poultry runs, being enclosed with wire netting for that purpose. This part was in an untilled condition, and on that account some of the trees were showing signs of weakness and getting hard in the bark, proving that cultivation was again necessary. Two lands among the pear trees were carrying a heavy sole of Paspalum, causing the trees to be in a very weak state. This was removed and cultivation carried on with satisfactory results. The black currants on the flat were fairly healthy, but carrying too much old wood. The gooseberry patch was in a bad way, a large percentage having died



PRUNING IN THE ORCHARD.

out and the rest being in a weak state. These I deemed advisable to root out, and the land is now being used for growing vegetables. The raspberry canes mostly were good, the exceptions being on the lowest part of the land where a good many bushes were dying owing to the land being too wet in winter. The fig trees not being considered profitable were removed, the land being used for early potatoes last season. The almond trees were also considered unprofitable in this climate and, with the exception of five trees, were removed and burnt, the land now being used for tomato growing.

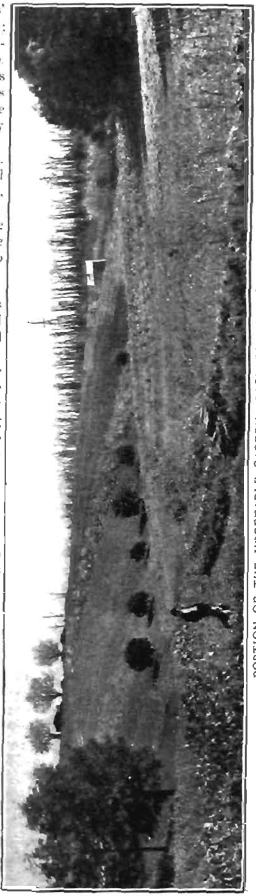
Generally speaking, the trees are at present in good condition having made good growth during the past season, especially where the crops were light.

The apple trees, with the exception of about four varieties, bore very good crops, the fruit being nearly all clean and well grown. The best varieties were Reinette de Canada, Rome Beauty, Sturmer, Five Crown, and Jonathan; the light crops being Munro's Favourite, Dumelow's

Seedling, Northern Spy, and Adams' Pearmain. Pears were a patchy crop: Vicar of Winkfield on the whole averaged about a medium crop; Winter Cole light; and the row of mixed varieties carried a very fair crop. Cherry plums were also light, but the Japanese were heavy. Raspberries turned out very well, considering the dry weather experienced during the picking season. Both red and black currants yielded good crops of fruit of first class quality, some of the latter being especially fine. Taking the orchard as a whole, the yield was very satisfactory. The total sales for the year amounted to £188 18s.

Woolly Aphis has again made its appearance on a few trees of several varieties. Red Spider and Mussel Scale are present on several trees, but I intend to spray for these with crude petroleum. I am sorry to say that the codlin moth is in the orchard, but only to a slight extent. During the coming season I intend to adopt means to stamp out this pest. Having been informed that Black Spot had in previous years been very bad in both apples and pears I took extra precautions and sprayed the whole of the trees twice with Bordeaux mixture, the result being an almost perfectly clean crop of fruit, only a few odd specimens showing traces of that disease.

Vegetable Garden.—Though a fairly large amount of vegetables has been produced, success has not been as great as might have been expected, chiefly owing to the dry season and a shortage of water. Cabbages did only fairly well: they suffered a good deal from the ravages of blight and cabbage moth, the dry season being favourable to both these pests. Peas generally did well all through the season, especially the late crop on the flat. The same remark applies to French beans, which stood the dry weather very well, and bore good crops. Onions only did fairly well, the weather being too dry for successful onion culture.



PORTION OF THE VEGETABLE GARDEN, ORCHARD IN BACK GROUND.

ORCHARD NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

Keep the soil surface well stirred.
Spray for Codlin Moth, Pear Slug, Peach Aphis, and Root Borer.
Examine graft ties; rub off unnecessary shoots on young trees.

The various cultivating implements and the spray pump should be very much in evidence during the month. Bountiful rains during the past winter have thoroughly soaked the subsoil, and there should be an ample supply of moisture for the sustenance of the trees, and for the production of fruit, provided it be properly conserved. This can only be done by keeping the soil surface in as fine a condition as possible; and it should be remembered that to keep the soil in a good tilth is the first and main condition for successful results. No matter how good or how rich a soil may be, if the surface is not well stirred, and well earth-mulched, the moisture evaporates from the soil, and the tree is not able to take advantage of its fertility.

Where hay crops have been grown amongst trees—and this is a very harmful practice (except on deep, rich, and moist alluvial soils) owing to the large amount of moisture removed by the crop—the ground should be well ploughed and harrowed *immediately* after the crop has been taken off, so as to conserve what moisture has been left in the soil.

Codlin Moth spraying should now be in full swing. The advice given in last month's "Notes" should be read and followed very carefully. The lessons of last season should be remembered; and apple and pear growers should make up their minds to carry on the spraying right through the season, so as to insure against a possible severe attack by late broods. The first capture of a Codlin Moth recorded last season in the Southern districts was reported from Diamond Creek on 16th October. At Harcourt, the first moth was caught on 10th October. At the Burnley Gardens the first eggs for this season were observed on 20th October. Frequent sprayings will be necessary at the present time, as owing to the expansion of the growing fruit, this is the only means of insurance against loss. Arsenate of lead is now the recognised spray for Codlin Moth, and this is procurable under many different brands.

Arsenate of lead may also be used against the Pear and Cherry Slug, care being taken that it is not sprayed on when the ripening season is approaching—hellebore should then be used. Tobacco solutions are also very effective, but should be used with caution, as the nicotine may taint the fruit, should it be far advanced. The Pear and Cherry Slug does far more damage than is generally understood. The foliage of the trees being largely, if not altogether destroyed by its attacks, there are no means for the elaboration of the sap, which is so necessary to the building up of the fruit buds for the next season. The bark is also exposed to the direct rays of the sun, and thus sun-scald, over-heated sap, gumming, and various other undesirable conditions are induced.

If trees have not already been sprayed for Woolly Aphis, Red Spider (*Bryobia*), and Peach Aphis, the tobacco or other nicotine solutions should be used without delay. For light attacks of Woolly Aphis, the sulphur-potash paint may be used, and it will give excellent results. The formula for this paint was given in the February, 1907, number of the *Journal*, and it may be repeated for the benefit of those who wish to try it. Dissolve 2 lbs. sulphate of potash in ½ gallon of water, and then mix in 2 lbs. of sulphur. When a thorough mixture is formed, add sufficient raw linseed

il to dilute it to the consistency of ordinary house paint. It may then e brushed on to the parts affected. This mixture will keep; and should : thicken it may again be reduced by the addition of more linseed oil. 'his is a very effective paint, and is easily handled where the attacks of Voolly Aphis are too light to warrant the use of the spray pump.

SHERRY: ITS MAKING AND REARING.

F. de Castella, Government Viticulturist.

(Concluded from page 630.)

Natural Increase in Strength.

That the alcoholic strength of sherry increases on storage in the bodegas, has already been pointed out (page 519). Though I was convinced of the accuracy of the statements made to me concerning it, in Jerez, it is so little in accordance with usual cellar experience that I was glad of an opportunity, on my return to France, of discussing the subject with Professor Bouffard, of the Montpellier School. He was able to fully corroborate what I had been told in Jerez, and mentioned similar cases which had come under his notice in France, especially in parts of the Roussillon district, where the natural strength of some of the wines made is high. He knew of special wines, kept in cask for years, in lofts of farm houses, where the natural increase in strength had been considerable. The conditions under which such increase occurred are very different to those prevailing in cool underground cellars, but similar to those met with in the well ventilated, aboveground bodegas of Jerez. The factors responsible for such changes, and the physical laws which govern them, are extremely complex, nor do they appear to have been experimentally investigated. They are, no doubt, intimately connected with the tensions of alcohol and water vapours, given off by mixtures of these liquids, in different proportions under different conditions of temperature, pressure, ullage of the cask, dryness of the air, &c., each of which exerts its influence, as does also the wood of which the cask is made. It has long been known that spirits kept in bladders increase very considerably in strength, water passing through the membrane and evaporating at its surface more readily than alcohol. The wood of the cask appears to act in like manner, and it is to this action that the increase is, in all probability, mainly due. It is, of course, only relative, there being no real gain in the absolute quantity of alcohol present, as would occur were the phenomenon due to fermentation. A portion of the alcohol evaporates also, but its loss being much slower than that of water, a relative gain, or, in other words an increase in strength is observed.

This development is better known in spirit stores than in wine cellars. In the cool and often moist atmosphere of the latter, conditions are entirely different, the loss of water being considerably retarded, so much so that, instead of an increase, a slight diminution of strength may result. In fact, this is usually what is noticed in a cool, well-kept wine cellar. A similar increase has often been observed in the case of brandy and other alcoholic liquors stored in bond and accurately gauged at regular intervals

under Excise supervision. The increase is not due to fermentation of unchanged sugar, for many of the wines in which it is most noticeable are quite dry, and therefore contain no more sugar after the close of their first fermentation.*

This natural increase is slow, but, under the conditions obtaining in the Jerez bodegas, it seems to be constant, sufficiently so for a high strength to be reached after a number of years. Several old añadas were shown to me which, though probably never fortified, had reached strengths of over 40 per cent. (proof). Some of these were 60 years old and over. These are, of course, exceptional wines, but they are striking examples of the steady gain in strength which takes place under the conditions ruling in the bodegas in which sherries are reared and matured.

Fortification.

Natural increase, however, is not sufficiently rapid to bring the strength of the wine to the point required by the trade, within a reasonable time. The great bulk of the sherry of commerce is, therefore, more or less fortified before being shipped, the strength being usually raised to something over 30 per cent. (proof). It is true that some sherries are shipped at a lower strength, chiefly lighter finos and manzanillas; a certain quantity of these two types enters England at the lower duty charged on wine below 30 per cent. (proof), but the great bulk pays the higher duty.

Much capital was made out of the fact that sherry was a highly fortified wine, a few years back, by certain persons, in England, who made a prejudiced attack on the wholesomeness of the wine. The unfairness of these strictures must strike any one who takes an impartial view of the question. No doubt fortification enabled the wine to better keep its condition, and it may be this that first led to the practice many years ago, but that it is not necessary for the purpose is evidenced by the lighter sherries which, though shipped at a moderate strength, retain their condition in a satisfactory manner. Fortification is resorted to because the trade requires it, and it is manifestly unfair to blame the merchants of Jerez for supplying the type of wine which is ordered from them in greatest quantity.

The spirit used for the purpose is highly rectified, and usually of a strength of about 65 per cent. over-proof. Great care is observed in its selection. A wine, in the making of which such care is taken to avoid the *basto* taint (page 582), is naturally only fortified with faultless spirit. Absolute neutrality is all the more necessary since fortification mainly takes place after withdrawal from the soleras, and therefore immediately before shipment.† The difference between the spirit used in the fortification of port (see *Journal*, March, 1908, page 186) and of sherry is very striking. Both are of excellent quality, but radically different in strength, character, and mode of distillation.

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* A specific case of similiar increase in strength is mentioned by C. A. Crampton and L. M. Tolman in a note on "*Whiskey Stored in Wood; changes taking place in.*" Jour. Am. Chem. Soc., 1908, 30, 98-136. "Thirty-one barrels of new spirits, representing types of rye whiskeys and Bourbon (maize) whiskeys . . . . . were set apart in different stores. . . . . During the eight years of storage the volume of the spirit diminished in many cases by one-half; this loss of volume is not due strictly to evaporation, but to osmosis through the pores of the wood, and depends very largely on the conditions of storage. Such osmosis is selective in its effects, the water passing out with much greater rapidity than the alcohol, which thus becomes concentrated. . . . . The rye whiskeys showed far greater losses of volume and chemical changes than the Bourbon whiskeys; this was due to the fact that the former were stored in artificially warmed warehouses, whereas the latter were not."

† Though mainly fortified at this stage, as has been already explained, the wine frequently receives small additions of spirit in the course of its rearing. Such increases in strength are, however, of small importance, the most considerable addition being the final one.

In the case of very highly rectified neutral (or silent) spirit, the material from which it was made ceases to influence its taste, and, until recently, any sufficiently "clean" spirit was used. the remission of Excise duty made in favour of wine spirit has led to the latter being now exclusively employed. Much of this spirit comes from the district of La Mancha (Valdepeñas and Manzanares), and from Cataluña. A movement is on foot for the establishment in rich, low-lying lands in the neighbourhood of Jerez, unsuitable for the production of high class sherry, of vineyards for the supply of fortifying spirit.

The Final Blend.

We have seen (page 516) that sherry, as met with outside Spain, is almost always a blended wine. The blending takes place usually a very short time before shipment, sufficient only to enable the wine to be fined before being sent out. Large stocks of ready blended wine are not kept in the bodegas. To attempt to describe the average composition of these blends would be only misleading. There is no average composition—each customer wants his own particular wine—usually a repetition of a previous order, though he may perhaps specify a slight variation in some particular direction; he may wish the wine to be more oloroso, or more amontillado, darker, or lighter in colour, &c.

Though the demand is now chiefly for the fino type, this is usually more or less modified by a certain proportion of oloroso, amontillado, or some of the composite soleras—sometimes by all three. The greatest complexity prevails, and scarcely two lots of sherry go out exactly alike.

According to the price the purchaser is prepared to pay, he will receive a blend made up exclusively of Solera wines or of these mixed with a varying proportion of the cheaper wines of the surrounding districts—Moguer, Arcos, Huelva, Seville, and even Valdepeñas, and Manzanares. Skill in blending is carried to a high degree, and, in the case of few other wines, is quality so exactly adjusted to money value. For example, there is remarkably little difference to be found between, say, fino wines at £40 a butt purchased from several of the leading Jerez wine firms. The exact composition of the blend being decided on, it is made up. A small quantity of sweet wine, either Pedro Ximenes or Paxarete, for high class sherry, is almost invariably added, and the strength is brought up to the required standard. If the colour is to be increased, this is done by adding a little vino de color (page 521).

Fining.

Sherry is nearly always fined (*bonificado* in Spanish) before being shipped. The process seems to be applied in the usual way, the fining materials in most general use being isinglass, eggs, and Spanish clay. Though chiefly exported in bulk, bottling arrangements on an extensive scale are conducted by most of the larger firms, as will be seen from the photograph of the bottling room of Diez Hermanos, reproduced in last issue.

Cognac Jerezano.

This description of the wines of Jerez cannot be closed without brief reference to the brandy now so largely distilled in the district, which is known throughout Spain as "*Cognac Jerezano.*" It has in that country

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almost entirely displaced French brandy. The soil of Jerez, like that of Cognac, is exceedingly rich in lime, though the two places are in widely different geological formations.

The establishment of this industry is largely the result of accident. In 1866 one of the large wine merchants (Pedro Domecq) received an order for 500 butts of fortifying spirit. This was distilled at too low a strength to be fit for the purpose, and remained in the store of the distillers for some years, during which time it improved so much that the production of brandy on a large scale was successfully tried. The photograph reproduced in last issue (page 627) shows the distillery at Gonzalez, Byass and Company's bodegas, and will give some idea of the importance of this modern industry. In this are shown, to the right, a still with wine heater of the type used in Charentes (France). This has been superseded by a type with lenticular dephlegmators to be seen further down the room. Brandy, in Jerez, is stored and matured on the Solera system.

Casks and their Seasoning.

Sherry is almost exclusively made, reared, and shipped in butts; casks of other sizes are unusual. The sizes of these vary somewhat, according to the purposes for which they are used, mainly between 110 and 120 gallons. Occasional larger ones are to be met with, such as the *Bota Gorda* of 130 to 140 gallons, and the *Bocoy*, with a capacity of over 150 gallons. Hogsheads and quarter-casks are seldom to be seen.

The seasoning of the casks is of considerable importance with wine of a delicate nature such as sherry, which is easily injured by foreign flavours. As in Oporto, Baltic oak is considered superior to American; owing to its higher price, however, the latter is now chiefly used, but before being filled with a high class wine the casks are very carefully prepared. One of the best methods is to allow them to remain full of cold water for several months, with occasional changes, after which they are filled for a few weeks with cheap though sound wine. The ammonia treatment is also largely used. Steam is blown through a small quantity of strongest liquid ammonia (2 quarts to a butt) by a pipe, reaching the bottom of the cask. This is provided with a special attachment, fitting tightly at the bunghole so that the steam and ammonia may together exert their influence, under a pressure of about 15 lbs. to the inch, for an hour. This treatment, followed by thorough washing and seasoning with cheaper wine, is said to entirely remove all objectionable flavour from American oak.

* * * * * * *

Such are the points which struck me as being of greatest importance in connexion with the unique wine known as sherry during a three weeks' stay in the district of its production. From what has been stated above it will be seen that sherry is a high class wine of very distinct character, resulting in the first place from soil, climate, and varieties grown, but in even greater degree from curious and very special methods of making and rearing—methods which considerably increase the cost of production, but in connexion with which nothing can be found to support the charges of unwholesomeness so often made against this wine a few years ago.

Fashion, however, seems to show a tendency to favour sherry once more, a change certainly merited by the magnificent wines, large stocks of which are still held in Jerez and the surrounding dsitrict.

POTATO EXPERIMENTAL FIELDS, 1908-9.

G. Seymour, Potato Expert.

During the season 1908-9 experimental work was carried out at eight centres, viz:—Broadford, Cheltenham, Coleraine, Daylesford, Larpent, Leongatha, Portland, and Warrnambool. Two of these, Cheltenham and Warrnambool, were devoted to the early crop. That at Cheltenham was carried out at Mr. J. Wedd's market garden, which is devoted exclusively to experimental work. As the soil is of the usual sandy nature characteristic of the market gardens in the vicinity of Melbourne, the results obtained on this plot should be of special interest to market gardeners. The other plot was at Mr. George Davidson's farm, near Warrnambool, where the soil is a rich volcanic. As the field had been under grass for a number of years, no manure was used, the object being simply a variety test, to discover the best early and main crop varieties suited to the district.

The other fields were as follow:—

Mr. John Zwar's farm, Broadford.—Chocolate volcanic soil on high ground; liable to dry out in the summer unless meeting with good summer rains.

Mr. J. Kirby's estate, Coleraine.—This plot was carried out under the auspices of the local Agricultural Society. The soil, which was of a stiff clayey nature, was too hurriedly prepared for potato planting, with the result that the crop here was a failure.

Mr. H. M. S. Cox's farm, Wombat Park, Daylesford.—The soil was a deep chocolate volcanic, well prepared.

Mr. W. Underwood's farm, Larpent, near Colac.—Virgin soil, sandy loam, on clay sub-soil.

Mr. F. Gooch's farm, Leongatha.—New land, light chocolate volcanic soil, from which a crop of greenstuff had been taken. This field received no preparation, and some doubt was entertained as to the wisdom of planting in it. As the district has a good rainfall the risk was taken and the seed was ploughed under the stubble.

MANURES USED.

CHELTENHAM PLOT.

1	2	3	4
12 lorry loads stable manure. 6 cwt. bonedust and superphosphate equal parts.	8 lorry loads stable manure. 6 cwt. bonedust and superphosphate.	8 lorry loads stable manure.	8 lorry loads stable manure. 6 cwt. bonedust and superphosphate. 1 cwt. sulphate of potash.

BROADFORD, DAYLESFORD, LARPENT, AND LEONGATHA PLOTS.

A	B	C	D	E
2 cwt. superphosphate.	4 cwt. superphosphate.	no manure.	2 cwt. superphosphate. 1 cwt. sulphate of ammonia.	2 cwt. superphosphate. 1 cwt. sulphate of ammonia. 1 cwt. sulphate of potash.

The results from the plots in previous years have indicated that little or no benefit is derived from heavy dressings of phosphoric acid, and this season's operations are no exception to the rule.

Harvest Returns from Potato Experimental Fields—Season, 1908-9

G. Davidson, Warrnambool.

Variety			Variety		
Bismarck ...	M.	5·4	Sutton's Abundance ...	M.	6·7
	U.	0·9		U.	1·4
Black Prince ...	M.	5·1	Up-to-date No. 1 ...	M.	5·8
	U.	1·5		U.	1·8
Carman No. 1 ...	M.	2·6	,, ,, 2 ..	M.	6·5
	U.	0·7		U.	1·4
Clarke's Main Crop ...	M.	5·5	,, ,, 3 ..	M.	7·0
	U.	1·4		U.	0·9
Fox's Seedling	M.	3·0	Vanguard	M.	2·7
	U.	1·0		U.	1·1
New Zealand Pinkeye ...	M.	5·1			
	U.	0·5			

No manure used.

M.—Marketable. U.—Unmarketable.

J. Wedd, Cheltenham.

—		Planted 3rd August, 1908.					Planted 18th September, 1908.				
		A.	B.	C.	D.	August Average.	A.	B.	C.	D.	September Average.
Fortyfold ..	M.	1.8	2.9	0.7	0.7	1.5					
,, ..	U.	1.1	1.4	1.2	0.9	1.1					
Fox's Seedling	M.	1.4	2.4	0.6	1.1	1.4					
,,	U.	0.9	0.9	1.1	0.8	0.9					
Lapstone Kidney	M.	0.7	0.9	0.4	0.7	0.6					
Vanguard ..	M.	2.4	2.7	1.0	1.5	1.9					
,, ..	U.	1.0	0.7	1.3	0.9	0.9					
Windsor Castle	M.	1.5	1.8	0.9	0.8	1.5					
Bismarck ..	M.	1.7	3.1	0.9	0.8	1.6	9.0	9.1	6.0	3.8	6.9
,, ..	U.	1.6	1.8	1.1	0.7	1.3	1.0	0.5	0.9	1.1	0.9
Black Prince ..	M.	2.1	2.7	0.9	0.6	1.5	8.4	6.2	4.4	3.8	5.7
,, ..	U.	1.5	2.1	1.2	1.7	1.6	1.0	1.9	1.8	1.5	1.5
Carman No. 1 ..	M.	1.5	3.9	1.3	1.8	2.1	9.0	6.5	5.6	6.4	6.8
,, ..	U.	0.8	0.8	0.9	0.7	0.8	0.7	0.8	0.9	0.8	0.8
Clarke's Main Crop	M.	4.1	5.2	1.0	2.6	3.2	4.3	8.4	7.3	6.2	8.3
,, ,,	U.	3.0	3.2	2.1	1.7	2.5	0.8	1.6	1.6	2.4	1.6
New Zealand Pinkeye	M.	..	..	..	..	..	8.4	5.9	5.0	4.1	5.8
,, ..	U.	..	..	..	..	..	1.1	1.0	1.8	1.6	1.5
Sutton's Abundance	M.	..	..	..	..	..	8.7	8.4	7.6	4.1	7.2
,, ,,	U.	..	..	..	..	..	1.9	1.8	1.6	1.3	1.6
Up-to-date ..	M.	3.2	4.5	2.1	2.3	3.0	11.4	8.3	6.9	5.0	7.9
,, ..	U.	1.5	1.0	1.1	1.0	1.1	1.1	1.2	1.6	1.9	1.4

Manure Dressings per Acre.—A, twelve loads stable manure, 6 cwt. superphosphate and bonedust; B, eight loads stable manure, 6 cwt. superphosphate and bonedust; C, eight loads stable manure; D, same as A and 1 cwt. sulphate of potash.

J. ZWAR, BROADFORD.

Variety.		First Planting.					Second Planting.				
		A.	B.	C.	D.	E.	A.	B.	C.	D.	E.
Bismarck ..	M.	1.7	2.0	1.8	1.8	1.0	1.6	2.0	2.2	1.7	1.1
,, ..	U.	0.7	0.7	0.9	0.8	0.8	0.4	0.4	0.3	0.4	0.4
Black Prince .	M.	2.4	1.5	1.6	1.4	1.0	1.3	1.0	0.7	1.0	0.7
,, ..	U.	1.2	1.2	1.3	1.1	1.1	0.6	0.5	1.1	1.0	1.1
Brown's River	M.	2.1	2.1	1.9	2.0	1.6	1.4	1.9	1.6	1.9	1.3
,,	U.	0.7	1.1	1.2	1.4	1.5	0.7	0.7	0.8	0.7	1.3
,,	M.	..	..	..	..	..	2.0	2.1	1.2	1.4	0.6
,,	U.	..	..	..	..	..	0.7	0.8	1.0	1.1	1.1
Carman No. 1 ..	M.	1.4	1.7	1.8	1.7	1.4	..	..	..	..	..
,, ..	U.	0.9	0.4	0.4	0.6	0.5	..	..	..	..	..
Clarke's Main Crop	M.	0.7	0.8	0.9	0.4	0.8	1.0	1.1	0.9	1.1	1.2
,, ,,	U.	0..	1.0	1.1	1.0	0.9	0.3	0.5	0.7	0.5	0.7
Cook's Favourite	M.	1.9	0.8	0.9	0.9	0.9	1.7	1.3	1.5	1.1	1.8
,, ,,	U.	0.3	0.2	0.3	0.5	0.4	0.4	0.5	0.6	0.5	0.6
Copperskin ..	M.	0.7	0.5	0.3	0.5	0.6	0.4	0.3	0.4	0.8	0.7
,, ..	U.	0.7	0.7	0.5	0.9	0.6	0.7	0.7	0.7	0.6	1.2
Fox's Seedling	M.	.03	0.4	0.7	0.5	1.1	1.7	1.3	1.1	1.4	0.6
,,	U.	0.2	0.3	0.5	0.4	0.5	0.3	0.4	0.1	0.3	0.1
New Zealand Pinkeye	M.	2.7	3.0	3.0	2.7	2.0	1.4	2.1	2.7	2.8	1.8
,, ,,	U.	0.5	0.5	0.4	0.5	0.6	0.8	0.3	0.6	0.3	0.4
Up-to-date ..	M.	1.5	1.4	1.5	1.1	0.8	1.8	0.6	0.6	0.3	1.1
,, ..	U.	1.0	1.2	0.8	1.1	1.1	0.5	0.7	0.7	1.0	0.7

Manure Dressings per Acre.—A, 2 cwt. superphosphate; B, 4 cwt. superphosphate; C, no manure; D, 2 cwt. superphosphate, 1 cwt. sulphate of ammonia; E, same as D, and 1 cwt. sulphate of potash.

H. M. S. COX, DAYLESFORD.

Variety.		A.	B.	C.	D.	E.
Up-to-date	M.	4.9	6.2	4.9	4.3	5.3
,, ...	U.	0.9	0.7	0.7	0.8	1.1
Snowflake	M.	6.6	7.3	5.9	4.6	5.3
,, ...	U.	0.4	0.4	0.3	0.3	0.4
Cook's Favourite	M.	2.9	2.2	2.2	2.8	2.1
,, ,, ...	U.	0.3	0.2	0.2	0.1	0.2
Delaware	M.	4.4	2.1	3.0	2.9	3.8
,, ...	U.	0.4	0.4	0.4	0.7	0.4
State of Maine	M.	3.0	1.7	1.6	2.8	2.5
,, ,, ...	U.	0.7	0.8	0.9	0.9	0.8
Brownell's Beauty	M.	2.3	2.0	1.5	2.7	1.7
,, ,, ...	U.	0.4	0.3	0.3	0.5	0.4
Green Mountain	M.	4.2	3.1	2.8	4.3	4.6
,, ,, ...	U.	0.3	0.4	0.5	0.5	0.4
Uncle Sam	M.	1.1	0.9	1.0	1.5	1.6
,, ,, ...	U.	0.4	0.7	0.4	0.3	0.8

H. M. S. Cox, Daylesford—*continued.*

Variety.		A.	B.	C.	D.	E.
Carman No. 1	M.	2.9	2.4	1.6	2.3	3.1
,, ,, ...	U.	0.4	0.4	0.3	0.3	0.2
Carman No. 3	M.	4.4	3.1	3.7	4.3	5.0
,, ,, ...	U.	0.4	0.3	0.2	0.3	0.2
White Prolific	M.	2.7	2.8	2.4	2.7	2.7
,, ,, ...	U.	0.7	0.8	0.8	0.7	1.5
Bresses' Prolific	M	3.1	4.4	3.9	3.9	3.9
,, ,, ...	U.	0.5	0.5	0.5	0.5	0.5
Tasmanian Red	M.	3.4	3.1	2.8	2.9	3.1
,, ,, ...	U.	0.9	1.0	0.7	0.4	0.9
New Zealand Pinkeye (F.C.) ..	M.	3.7	4.5	4.1	3.1	3.4
,, ,, ,, ..	U.	0.3	0.3	0.4	0.3	0.4
,, ,, (D.C.) ..	M.	4.5	5.1	4.9	4.3	3.9
,, ,, ,, ..	U.	0.3	0.4	0.3	0.2	0.5
Brown's River	M.	4.4	4.8	4.3	4.2	4.3
,, ,, ...	U.	0.8	1.0	0.8	0.8	0.9
Black Prince	M.	4.2	3.7	3.4	3.4	3.3
,, ,, ...	U.	0.8	1.0	0.5	0.5	0.5
Copperskin	M.	4.4	3.1	3.1	2.3	2.9
,, ,, ...	U.	0.7	0.8	0.9	1.2	0.8
Needlevisor	M.	2.7	3.6	3.1	3.7	2.3
,, ...	U.	0.7	0.4	0.3	0.4	0.7

Manure Dressings per Acre.—Same as Broadford.

F.C.—Full Crowns. D.C.—Deep Crowns.

W. Underwood, Larpent.

Variety.		A.	B.	C.	D.	E.
Clarke's Main Crop	M.	3.6	4.1	2.3	4.1	2.6
,, ,, ,, ..	U.	1.1	1.0	1.1	1.5	1.3
Sutton's Abundance ..	M.	3.4	3.2	2.0	3.1	2.3
,, ,, ...	U.	1.5	1.8	1.1	1.8	1.2
New Zealand Pinkeye ..	M.	2.9	3.5	2.0	3.2	3.1
,, ,, ..	U.	0.8	0.9	0.9	0.9	0.8
Black Prince	M.	2.9	2.0	2.3	2.4	2.3
,, ,, ...	U.	0.4	0.8	1.2	1.5	1.2
Brown's River ..	M.	2.6	2.4	1.9	2.2	1.8
,, ,, ...	U.	1.9	1.5	1.5	1.6	1.6
Cook's Favourite	M.	3.8	3.6	2.1	3.6	3.6
,, ,, ...	U.	0.9	0.5	0.6	0.9	0.9
Scotch Grey	M.	3.1	3.4	2.4	3.0	2.7
,, ,, ...	U.	1.7	1.6	0.9	1.1	1.1
Brown's River	M.	3.1	2.2	2.3	2.4	2.7
,, ,, ...	U.	2.3	2.2	1.6	1.5	1.6
Copperskin	M.	3.5	3.8	2.7	4.0	4.4
,, ...	U.	2.0	1.5	1.2	1.6	1.6
Up-to-date	M.	4.1	4.9	3.0	4.5	4.5
,, ...	U.	1.8	1.7	1.5	.	1.4

Manure Dressings per Acre.—Same as Broadford.

F. GOOCH, LEONGATHA.

Variety.		A.	B.	C.	D.	E.
Sutton's Abundance (Portland seed)	M.	3.0	2.5	1.5	2.4	3.1
,, ,, ,, ,,	U.	0.3	0.3	0.2	0.4	0.6
Royal Kidney	M.	2.7	2.1	0.8	1.2	1.7
,, ,, ...	U.	0.7	0.8	1.0	0.8	0.7
Sutton's Abundance (Kinglake seed)	M.	7.3	4.2	2.1	5.6	5.1
,, ,, ,, ,,	U.	0.3	0.2	0.1	0.3	0.4
Fox's Seedling	M.	4.7	2.6	2.0	3.0	4.5
,, ,, ...	U.	0.6	0.2	0.8	0.3	0.3
Adirondak	M.	3.7	3.2	2.0	3.1	2.7
,, ...	U.	0.2	0.2	0.1	0.1	0.1
,, (Colac)	M.	3.3	3.1	2.0	4.0	3.5
,, ,, ...	U.	0.2	0.3	0.2	0.3	0.2
The Bruce	M.	2.6	2.6	1.4	2.7	2.5
,, ...	U.	0.4	0.7	0.6	0.7	0.6
Tasmanian Red	M.	3.2	2.5	1.7	3.3	3.3
,, ,, ...	U.	0.4	0.3	0.3	0.4	0.3
Up-to-date	M.	3.4	4.0	2.7	4.7	6.1
,, ...	U.	0.4	0.6	0.7	0.6	0.4
,, (Romsey) ..	M.	5.0	4.2	2.3	6.3	4.6
,, ,, ...	U.	0.2	0.3	0.3	0.4	0.6
Orr's Wonder (Kilmore) ..	M.	5.1	5.0	2.7	5.2	6.2
,, ,, ,, .	U.	0.1	0.1	0.3	0.2	0.1
,, ,, (Portland) ..	M.	4.0	3.6	1.5	4.7	5.4
,, ,, ,, ..	U.	0.1	0.2	0.3	0.2	0.2
Brown's River	M.	3.5	3.6	1.7	4.7	5.0
,, ,, ...	U.	0.4	0.4	0.6	0.4	0.4
Bismarck	M.	2.7	2.8	1.2	3.2	3.3
,, ...	U.	0.1	0.1	0.1	0.1	0.2
Daniel's Sensation (Kinglake)	M.	2.5	2.4	1.5	2.7	2.9
,, ,, ,, ..	U.	0.7	0.6	0.8	0.6	0.4
,, ,, (Portland)..	M.	2.2	2.0	1.1	2.5	2.6
,, ,, ...	U.	0.8	0.7	1.1	0.8	0.7
New Zealand Pinkeye ..	M.	4.0	4.3	2.6	5.8	5.7
,, ,, ..	U.	0.1	0.1	0.3	0.2	0.2
Black Prince	M.	4.1	4.1	2.8	4.3	4.3
,, ,, ...	U.	0.4	0.4	0.6	0.3	0.4

Manure Dressings per Acre.—Same as Broadford.

CHELTENHAM PLOT EXPERIMENTS.

The questions to which the experiments on this plot were expected t supply an answer were :—

1. Which is the most suitable early and main crop variety to grow for th metropolitan market?

2. What effect on the yield has sprouting the seed in trays, and what is th approximate cost per acre of sprouting seed?

3. Which variety handles best when sprouted?

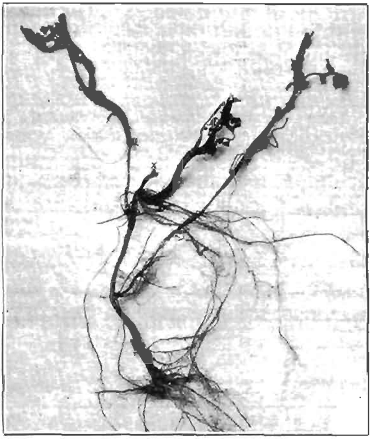
4. Does spraying check disease, and what effect has it on the yield?

5. What is the most profitable quantity of stable manure per acre, and whic is the most suitable combination of stable and artificial manures?

1. Included in the test were the following well known varieties:—Early Rose, Fox's Seedling, Lapstone Kidney, and Windsor Castle. Th whole of these may be classed as failures, as some did not produce an tubers large enough for market. The field was planted in two sections No. 1 on 3rd August, with unsprouted seed, and No. 2 on 18th Septemb with sprouted seed.

The following were used in both plots:—Bismarck and Carman No. 1 for the early crop, and Clarke's Main Crop, and Up-to-date for the main crop. Of the two early varieties, Bismarck gave slightly the heaviest yield in the sprouted lot, but in the averages of the two plantings, Carman No. 1 was slightly ahead. When quality is taken into account, the latter was by far the most profitable potato for the early crop. Of the main crop, Clarke's Main Crop proved the most productive in both sections, with Up-to-date a good second. Black Prince, a purple skinned variety, was included to test its suitability for early crop export.

2 and 3.—The results from sprouted seed were extraordinary. Although such heavy yields from late planting may not always be obtained, one thing is certain, and that is, the chances will always be in favour of the crop which runs on to maturity without a check. The potato is a sun plant, requiring heat and moisture: the tubers do not sprout freely until the temperature ranges over 50 degrees F. There is also the danger of frost with an early planted crop, which is fatal to all the finer quality and early-maturing varieties. When a plant is cut back by frost, it has to make a new growth which must start from the nodes of the main stem below the surface of the ground, with the result that five or six weak stems are produced instead of one strong main stem.



EFFECTS OF FROST ON POTATO PLANT.
x indicates original stem.

The soil temperature at 11 a.m. on the 3rd August, when the first section was planted, was 48 degrees F. and the atmosphere 50 F., whilst at 9.30 a.m. on the 9th September, after a heavy frost, the soil registered 52 degrees and the atmosphere 54 degrees. At 3 p.m. the soil was 56 and the atmosphere 68 degrees. These temperatures were rising daily, with the result that the plants came up quickly, being over ground in ten to twelve days. They grew vigorously from the start, escaping frost, while the early section was cut back twice.

The objection has been raised that the crop from sprouted seed will be too late for early market, but it was found that the late planted section could have been marketed in cases at the same time as the early ones. With some of the varieties, the increased yield would have amounted to £30 per acre in favour of sprouted seed. Another objection is the cost of trays and the extra time required in handling the seed when planting. If

anything like the returns of last season can be obtained, the extra cost, which does not amount to more than £1 per acre, is not worth considering. Another matter that must not be lost sight of is the quality of the produce. A light crop generally yields a large proportion of small or misshapen tubers. This was the case in the experiments under review, as the following table shows:—

TABLE I.

Name of Variety.	*Planted.*	
	3rd August.	18th September.
	Percentage of Small.	Percentage of Small
Carman No. 1	14·8	10·4
Bismarck	44·0	10·8
Up-to-date	27·0	15·5
Clarke's Main Crop	42·0	16·0
Black Prince	51·0	18·0

Table *II.* shows the averages per acre of the sprouted and unsprouted seed, and also the increased yield obtained by sprouting, together with remarks as to condition of the produce.

TABLE II.

Variety.	Sprouted.	Unsprouted.	Increased Yield.	*Sprouted.* Remarks.	*Unsprouted.* Remarks.
	tons cwt.	tons cwt.	tons. cwt.		
Carman No. 1	6 16	1 16	5 0	Very fine even run of tubers	Few fine; many undersized.
Up-to-date ...	7 18	3 0	4 18	Very fine even run of tubers	Large percentage undersized.
Clarke's Main Crop	8 3	3 4	4 19	Fine and even ...	Large quantity small.
Bismarck ...	6 18	1 12	5 6	Very fine tubers...	Large quantity small and misshapen.
Black Prince	5 14	1 10	4 4	Fairly even run ...	Very poor lot.

4. At all the centres mentioned the crops were clean and free from disease of any kind. At the Cheltenham plot advantage was taken to test the effects of spraying, the dressing used being the copper soda solution. Two sprayings were given with a hand pump, but as no disease appeared in the crop, no difference in the yield was found in the sprayed and unsprayed portions. There was, however, a noticeable difference in the plant as the sprayed portions kept green longer than the unsprayed.

As much loss has been sustained this season on account of scab and eel worm, it may not be out of place to state that these diseases have only been met with in the experimental plots in two instances in four years—one of scab in 1905-6 plots, and one of eel worm in 1907-8. The variety attacked by scab was Carman No. 1. Before planting the following season, this seed was treated with corrosive sublimate, 1½-oz. to 7 gals. of water soaked for 1½ hours. The case of eel worm was met with in an isolated spot, and all the affected tubers were rejected. No appearance of either disease has been met with since.

5. The results of the various manures used are given in Mr. Lee's report published herewith.

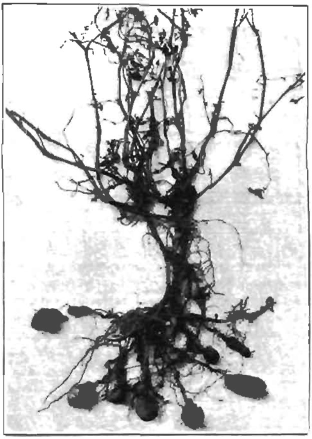
The Varieties.

New Seedlings.—The raising of new varieties from seed, that is, the fruit or balls of the plant, has not been very successful in the past. Many attempts have been made and new varieties have been produced, but few have proved of any value. Mr. P. J. Ryan, of Millbrook, an enthusiast in the work, has, after years of patient work, succeeded in producing a number of varieties which promise satisfactory results. They are heavy croppers and have been selected for their cooking qualities. Being dark-skinned, they should prove useful sorts for export. The names and yields of the best varieties are as follow:—

Wellington, 17½ tons.	Norfolk, 12¼ tons.
Bedford, 13 tons.	Sussex, 11½ tons
Marlborough, 13 tons.	St. Albans, 7 tons 7 cwt.

The above varieties are a cross between New Zealand Pinkeye and Brown's River, using the pollen of the former. Seed of all has been supplied to the Department of Agriculture for experimental purposes, and the results will be watched with interest.

Solanum Commersonii.—The accompanying illustration shows the plant and tubers of the *Solanum Commersonii*, a species of the wild potato. It may be mentioned that the potato of commerce hitherto grown in Australia is known as *Solanum tuberosum*. A shows the produce of the wild plant, and B a variety known as *Commersonii violet*. This potato was produced in 1901 by M. Labergerie of France, and forwarded in 1908 with six other varieties which had been raised in the same manner. It is dark violet in colour, and resembles the Brown's River variety. The flesh is white and of fine texture and good flavour. It promises to be a good cropper. Another important feature of this variety is the hardy nature of the plant; it stands frost wel and has proved itself a disease resister. If the Blight should spread in Victoria it will, on that account, prove a valuable addition to the varieties grown in this State.



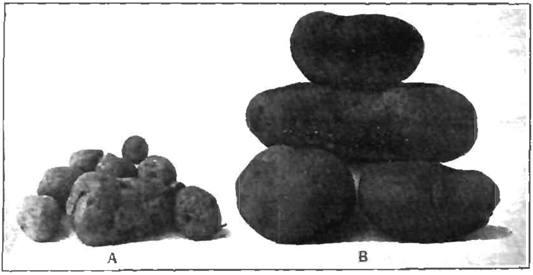
THE WILD POTATO.
(*Solanum Commersonii.*)

New Zealand Pinkeye.—This variety has received considerable attention during the past two seasons. It has proved itself a useful early variety, having a fairly hardy plant, but the tubers have two objectionable features, viz., deep eyes, and, under adverse weather conditions, the habit of producing hollow tubers. They are also very susceptible to scab and eel worm.

This variety was tested against Carman No. 1 at Mr. Davidson's farm at Warrnambool. The results were entirely in favour of the New Zealand Pinkeye, as the following table will show :—

Variety.	Table.	Small.
	Tons. Cwt.	Cwt.
New Zealand Pinkeye	5 1	15
Carman No. 1	2 12	14

At Daylesford it also gave much the heaviest yield; on the other hand, Carman No. 1 has given very satisfactory returns in the Newlyn district. The cause of the light yield of Carman No. 1 in the two plots mentioned was no doubt due to frost. A point in favour of New Zealand Pinkeye is that the plants make a better recovery after frost than most early sorts.



A. THE WILD POTATO. B. COMMERSONII VIOLET.

The experiments in connexion with the improvement of the type of this variety mentioned in my last report were continued at Mr. Cox's farm at Daylesford. In this plot 400 sets (200 each of full crowns and deep crowns) were planted in the plot, with the following results :—

Character of Seed planted.	Character of Produce.		
	Full Crown.	Deep Crown.	Medium Crown.
	Per cent.	Per cent.	Per cent.
Full Crowns	10·5	7	82·5
Deep Crowns	11·5	22	66·5

From the above it will be noticed that the deep crown seed produced 1% more of the desirable type than the full crowns, but the former produced 15% more of the deep crowns.

GREEN MOUNTAIN.—One of the most promising main crop varieties is Green Mountain, an American variety, of very robust habit, white skin and very white flesh. It is a good cooker and bears a strong resemblance to Carman No. 3.

ADIRONDAK.—This also is an American variety. It is fairly early and has a russet skin and very white flesh. This potato has been sold under the name of Excelsior, and there is not the slightest doubt but that it is the variety which gave the reputation to the Excelsior. The variety mostly grown for Excelsior is the Reading Russet, a much heavier yielding and later maturing variety, of a lower cooking quality; it is a good keeper, and may be used very late in the season, as it cooks better than when newly dug.

DISEASES.

IRISH BLIGHT.—The year 1909 will be memorable in the history of potato growing as that in which the Irish Potato Blight was first discovered in all the States of the Commonwealth. As far as this State is concerned, there is no doubt the disease had been present in the locality where it was discovered for a season or two. The fact that it was found after a careful inspection of the potato districts to be confined to a comparatively small area in one part of the State renders it an easy task to prevent the spread of the disease, and with strict quarantine regulations rigorously administered to stamp it out. Such regulations must prevent the planting of potatoes in a quarantined area altogether, for a few seasons, and the destruction of all self-sown plants that may come up in fields where potatoes have been grown.

Unfortunately, many persons declare that it is not the Irish Blight, and make this statement on the authority of persons who claim to have had experience of the disease in the old world. To show what serious consequences may arise from such an attitude, it should only be necessary to mention the case of New Zealand, where the disease was present for 10 or 12 years before it did serious damage to the crop. It was then found in every part of the Dominion. No doubt farmers are not inclined to give up so profitable a crop and cast doubt on the conclusions arrived at by the Vegetable Pathologist, who is the person most qualified to determine the disease.

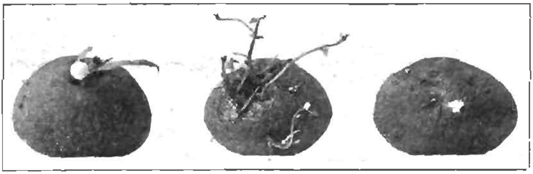
Another and more serious danger is that growers may have the disease in an apparently mild form; mild only because the weather conditions have not been favourable to the development and spread of the disease. Realizing that they will be quarantined if they make the presence of the disease known, they will conceal it as long as they can and market their produce as quickly as possible, with the result that the disease will be spread to other parts of the State, when extermination will be impossible. The only alternative will be spraying with Bordeaux mixture. If growers would only realize what a handicap to the industry spraying will be, they would be aroused from the state of indifference and doubt to which they seem to have settled down.

The matter is of such importance that one would have expected all the growers in the State to have met together to agree upon the best means of eradicating the disease, and to devise a scheme to compensate those who are compelled to surrender their crops for the general good of the industry.

SPINDLE DISEASE, OR "THREADYEYE."—This affection of the potato is known in every part of the world, and by different names. In France it is termed "Filosite"; in England "Spindle disease"; and in this State "Cottonyeye" or "Threadyeye." One of the first matters brought under notice in this connexion with the experimental potato growing was this disorder of the tuber which renders it useless for seed purposes. In

the latter part of 1905 specimens were sent from a Gippsland district. These were brought under the notice of the Vegetable Pathologist, Mr. McAlpine, who failed to discover any trace of disease in the tubers. During 1906-7 parcels were submitted with the same result.

This finding accords with observations in other parts of the world. It has been ascribed to degeneration, due to using the same seed in the same soil for long periods. Whilst this may be a contributing cause, there are evidently others at work, for I have grown the same variety



TUBERS FROM PLANTS AFFECTED WITH SPINDLE DISEASE.

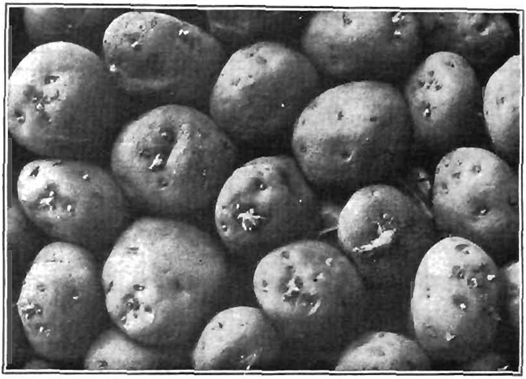
from the same seed for 25 years continuously in the same soil and not found them affected, whilst the same seed sent to another district would in two seasons be almost useless for seed purposes. Observation of the growing crop has enabled me to detect, with a degree of certainty, the plants which will produce blind and defective tubers. The illustrations on this page show the results obtained from a parcel lifted in May, 1907, and planted on the 30th September of the same year. The tubers from the affected plants were either blind or defective. Another of our illustra-

TUBERS FROM NORMAL PLANTS.

tions shows the condition of an average sample taken from a parcel amounting to upwards of 10 cwt., lifted in February, 1909. Of these, 150 average sets were placed in trays and by the 1st July only two tubers had sent out a strong bud.

If future observations fail to reveal any form of disease, or no remedy can be discovered, it will be a decided gain to growers to be able *to harvest such plants and dispose of them for table use, instead of having* to discard them at planting time when the seed is sprouted.

One grower informed me that he purchased 10 tons of seed, which cost £50. Of this, he had to discard 3 tons, and the crop produced by the balance was of such inferior quality that he had to refuse orders for seed and therefore he sustained a loss which he estimated at £150. Instances are on record in Great Britain where whole parcels, in one case amounting to 70 tons, were discarded. In Westphalia in Germany the diminution of the crop in 1905, in the case of one variety, ranged from 5% to complete failure and averaged from 50 to 75%.



AVERAGE SAMPLE FROM PARCEL OF POTATOES AFFECTED WITH SPINDLE DISEASE.

The potatoes, amounting to 10 cwt., were lifted in February, 1909. Of these, 150 average sets were placed in trays and by 1st July only two tubers had sent out a strong shoot.

Manure Experiments with Potatoes.

F. E. Lee, Agricultural Superintendent.

From the point of view of manuring of potatoes, facts of consequence have yet to be established. It is generally admitted that artificial manures produce a profitable increase in the yield of a crop over their cost, but which is the best combination of manures and especially what is the most economical amount to use per acre, are some of the points which the experimental fields herein dealt with are endeavouring to ascertain. It is very commonly reasoned that because one or two hundredweights per acre of manure produce a satisfactory increase in yield, that double or treble those dressings should produce correspondingly increased yields.

This process of reasoning is faulty and has in many cases led to a considerably increased cost of production without any compensating increase in yield. It would appear that the potato-grower, in like manner as the grower of almost every other specialized product, has yet to learn what help he may legitimately expect from manures. It may also be added that far too many potato-growers try to remedy an imperfect preparation of their land by the use of unnecessarily heavy dressings of artificial fertilizers. All the fertilizers under the sun will not increase an inadequate moisture supply, and the not uncommon experience of crops actually "burnt" by heavy applications of soluble fertilizers is the result of such ignorance. The table below shows the effects of artificial manures on potato crops in such widely scattered districts as Broadford, Daylesford, Larpent and Leongatha. The general uniformity of the results must commend them to potato-growers who are interested in the establishment of facts for future guidance.

The average yields per acre for the various sections do not differ widely, but the cost of application of the manures shows very plainly which dressing has been the most economical.

Grower's Name.	District.	A. 2 cwt. Superphosphate per Acre.		B. 4 cwt. Superphosphate per Acre.		C. No Manure.		D. 2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia, per Acre.		E. 2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia, 1 cwt. Sulphate of Potash.	
		Marketable.	Unmarketable.	Marketable.	Unmarketable.	Marketable.	Unmarketable.	Marketable.	Unmarketable.	Marketable.	Unmarketable.
		Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
J. Zwar ..	Broadford (early) ..	1.54	0.70	1.42	0.73	1.44	0.74	1.30	0.83	1.12	0.80
J. Zwar ..	,, (late) ..	1.43	0.54	1.37	0.55	1.29	0.66	1.35	0.64	1.07	0.76
H. M. Cox ..	Daylesford ..	3.67	0.54	3.46	0.56	3.16	0.49	3.31	0.51	3.46	0.61
W. Underwood ..	Larpent	3.30	1.44	3.40	1.30	2.30	1.16	3.25	1.39	3.00	1.27
F. Gooch ..	Leongatha ..	3.72	0.35	3.26	0.36	1.86	0.46	3.85	0.40	4.06	0.37
		2.73	0.71	2.58	0.71	2.01	0.70	2.61	0.55	2.54	0.76
Average yield per acre ..		3.44 tons		3.29 tons		2.71 tons		3.16 tons		3.30 tons	

	Cost of manures per acre.	Yield per acre.
Section A	9s. ..	3 tons 8 cwt.
,, B	18s. ...	3 ,, 4 ,,
,, C	nil. ...	2 ,, 14 ,,
,, D	24s. ..	3 ,, 9 ,,
,, E	39s. ..	3 ,, 9 ,,

Allowing the average price of potatoes to have been £4 per ton the profit on section A, after deducting cost of manures, would be £2 15s. per acre; section B, £1 2s.; section D, £1 16s.; section E, £1 1s. While this may be taken as a proof that manuring pays, it may also be used to direct the attention of the potato-grower to the fact that it is generally more profitable to manure a crop intelligently than lavishly.

HARVEST RETURNS FROM MR. GEORGE EDWARDS' PLOT, PORTLAND.

Variety.	Section A. 1 cwt. Superphosphate per Acre.						Section B. 1 cwt. Superphosphate, ½ cwt. Sulphate of Ammonia.						Section C. No Manure.						Section D. 1 cwt. Superphosphate, ½ cwt. of Sulphate of Ammonia, ½ cwt. Sulphate of Potash.						Total Weight per Acre of Tubers actually Dug.						Per centage of each Variety.	
	Marketable.			Unmarketable.			Marketable.			Unmarketable.			Marketable.			Unmarketable.			Marketable.			Unmarketable.			Marketable.			Unmarketable.			Marketable.	Unmarketable.
	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	per cent.	per cent.
Snowflake ..	1	10	3	0	9	1	2	1	2	0	13	2	1	1	0	0	8	0	4	5	3	0	8	0	2	12	2	0	10	0	84	16
Scotch Grey ..	1	8	2	0	19	3	3	9	2	1	1	0	0	17	2	1	1	3	3	17	3	1	17	1	2	12	6	1	2	2	70	30
Copperskin ..	1	13	1	1	1	0	2	1	0	1	17	2	0	10	0	0	19	0	2	18	3	1	13	0	1	15	0	1	5	0	59	41
Clark's Main Crop	3	5	0	0	14	1	3	4	0	0	9	2	1	3	3	0	8	2	5	18	1	0	14	1	3	7	2	0	12	0	85	15
Blue Prolific ..	1	7	3	0	10	3	2	10	3	0	9	0	0	4	1	0	6	1	3	17	0	0	8	3	1	18	2	0	8	2	82	18
Bismarck ..	1	3	3	0	3	3	2	4	2	0	2	2	0	9	0	0	4	2	3	6	3	0	3	3	1	18	1	0	3	2	92	8
White Prolific ..	1	5	2	0	10	2	2	7	0	0	11	1	0	12	3	0	9	2	4	13	0	0	8	0	2	4	2	0	9	3	83	17
	1	13	2	0	12	3	2	16	3	0	14	3	0	14	0	0	11	0	4	2	2	0	16	0								
Total Weight per Acre ..	Tons cwt. qrs. 2 6 1						Tons cwt. qrs. 3 11 2						Tons cwt. qrs. 1 5 0						Tons cwt. qrs. 4 18 2													

Portland Plot.

The future development of the heath land at Portland seems likely to add a new potato producing district to the State. The plot upon which the present experiment was carried out is looked upon as an extremely poor sandy soil, inferior to the average heath land. Four tons per acre from land, which a year or two ago sold freely at £1 10s. per acre, is a highly profitable return. Much valuable information has already been gained in regard to the comparative suitability of numerous varieties, and this, supplemented with accumulating facts in connexion with manures, must place the future production of potatoes on the heath land on a sound basis. The returns from Mr. George Edwards' plot at Portland are given on the previous page.

The yield of potatoes is progressive with the manures used. Upon such soil, naturally poor in the essential plant foods, an excellent response to manures is to be expected. Section C, unmanured, returned 1 ton 5 cwt. per acre, of which 11 cwt., or 44 per cent., were unmarketable. It is quite probable as the heath land is brought under a proper rotation of crops and the soil accumulates a supply of humus, that not only will better yields be produced, but the cost of the manures will diminish. These sandy soils have the supreme advantage of being easy to work, they drain well and are very responsive to manures, hence the future of the large tract of similar country in south-western Victoria may be regarded with optimism.

Cheltenham Plot.

The overseer of the experimental market garden carried out the following interesting test with stable and artificial manures, used singly and in combination:—

—	Early Planting.		Late Planting.	
	Marketable.	Small.	Marketable.	Small.
	Tons.	Tons.	Tons.	Tons.
12 Loads of Stable Manure, 6 cwt. Superphosphate and Bonedust .. .	2·10	1·42	8·40	1·00
8 Loads of Stable Manure, 6 cwt. Superphosphate and Bonedust	3,01	1·48	7·50	1·30
8 Loads Stable Manure	·98	1·32	6·10	1·40
12 Loads of Stable Manure, 6 cwt. Superphosphate and Bonedust, 1 cwt. Sulphate of Potash	1·29	1·05	4·70	1·50

In this instance there is a considerable superiority of the late over the early planting. Unfavourable climatic conditions would largely account for the discrepancy between the yields and, moreover, two of the heaviest yielding varieties, New Zealand Pinkeye and Sutton's Abundance, were not among those sown in the spring. Several light yielding varieties, such as Windsor Castle, Vanguard, Fortyfold, Lapstone Kidney and Fox's Seedling, were also omitted from the late sowing. The effects of the manures, both organic and artificial, are most interesting and in no way more so than as an illustration of how the proportion of the marketable to the unmarketable tubers is controlled by the manures used.

GREEN MANURING.

As stated in the last issue of the *Journal*, regular lectures dealing with the scientific aspect of the work in hand are delivered at the Rutherglen Viticultural College. On the following evening essays on these addresses are written by the boys at the College. The following essay on Green Manuring, by one of them (H. Nash, aged fifteen years), shows that an interest is taken in, and some of the points are grasped, by the boys:—

"The soil is a storehouse and a factory. We call it a storehouse because in the soil are stored the materials needed for the plant to live. It is called a factory because it acts on these materials, so rendering them ready for the plant to feed on.

"There are no other ways of permanently improving the soil so efficiently and so cheaply as green manuring. It adds valuable materials and also enables certain useful changes to take place in the soil. Heavy land is loosened by humus. Humus makes the soil more absorbent, enables it to retain moisture and warmth, permits air to enter, and allows the useful bacteria to work better. The best sort of plants for green manuring are podbearing plants. These plants can take nitrogen from the air by means of bacteria. The bacteria make their home in the little nodules on the roots of these plants, and are thought by some people to be a disease.

"The best time to plough in a green crop is when it is in full bloom, for then it is richest. It has stored up food ready for the pod. The water, carbonic acid gas, fermentation germs, and bacteria cause the plant to decay. This sets up chemical changes in the soil, which turn the insoluble or dormant parts of soil into active or soluble plant food. Growing plants get some of their food from the subsoil. This is deposited in the surface soil by green manuring. Green manuring improves the soil by:—

1. The addition of humus, which helps to keep the soil loose.
2. The addition of nitrogen.
3. The decay of plants acting chemically on the soil.
4. Liberating the food drawn up from subsoil.
5. Enabling bacteria to do good work.
6. Adding considerable quantity of water.

Green manuring is specially valuable in the orchard and vineyard."

ANSWERS TO CORRESPONDENTS.

CEREAL HOEING IMPLEMENTS.—T. McP. asks:—(1) Whether there is any implement in use in Victoria that is suitable for cultivating between the 7-inch rows of crop, as planted by the ordinary seed drill? (2) Whether it would be advisable to plant the usual quantity of grain, but in fewer rows, say, 1 foot apart, to allow of more successful inter-row cultivation.

Answer.—(1) Some years ago there was a cereal hoeing implement on the market, but it never came into general use. (2) The practice of wider spacing of rows for cereals than the usual 7 inches has been tried, with unsuccessful results. Weeds are found to occupy the vacant land, and compete with the crop for moisture.

W.S.B. inquires as to the best varieties of maize for the Koo-wee-rup district.

Answer.—For grain purposes, the Early Yellow Dent will be found most likely to give a good yield. For fodder purposes you cannot do better than try Hickory King, Yellow Moruya, or Eclipse.

MAIZE GROWING.—Red Gum asks :—(1) Which is the best variety of maize to grow for grain in the deep red loam of Cohuna; (2) the number of waterings; (3) the probable yield. He also inquires whether millet is a good crop to grow for hay.

Answer.—(1) Early Yellow Dent will be most likely to give a satisfactory yield of grain. (2) Three waterings should be sufficient—one before sowing, one when plants are 3 feet high, and one just at the time the plants flower. (3) From 50 to 60 bushels per acre, or possibly higher. (4) Japanese millet is the most favoured of the Millet family. It makes good coarse hay.

TREATMENT OF GRAVELLY SOIL.—A.M. desires information as to the best course to adopt after levelling to bring an area of "shallow diggings" country into fit condition to grow a crop that could be ploughed in to enrich it. The soil is gravelly, and sets hard in summer.

Answer.—Soil of the character mentioned could only be made to produce successful crops y the liberal use of farm manure. This would prevent the soil from baking in the summer and would also assist it to accumulate and retain moisture for a much longer period. Crops suitable for ploughing in for green manure are peas, vetches, or rape.

EARTH-EATING HABIT.—W.P. writes :—"Last year one of my foals died when two weeks old. Prior to that it was doing well, but on *post-mortem* examination, the stomach was found to be full of dirt and rubbish. Recently another foal was taken bad, but, as he was very costive, a dose of oil was given, with satisfactory results. What is the cause of the foals eating earth?"

Answer.—The mare should be fed liberally on hard feed, and the foal given an occasional dose of oil. The earth-eating habit may be due to the lack of earth salts in the pasture, or desire on the part of the animal to correct the undue acid secretions of the stomach.

SKIN CRACKS.—W.R.Z. inquires as to treatment of small cracks just above the hind fetlocks and a crack behind the knee. He also states that a soft lump about the size of a hen's egg, and apparently containing liquid, has appeared on the point of his stallion's stifle.

Answer.—(1) An application of boracic acid ointment is advised. (2) The enlargement is caused by an excess of the joint oil. Blister lightly with red mercury blister.

FEEDING VALUES.—H.T.L. states that, as he has not much grass, he is feeding chaff to his milking cows. He wishes to know the relative values of Algerian oats, bran, oil-cake for mixing with the chaff. At time of writing the ruling prices were :—Algerian oats, 1s. 9d. per bushel; bran, 1s. 1d. per bushel; oil-cake, 9s. 6d. per cwt.

Answer.—Calculating the feeding value of oil-cake at 100, oats have approximately a relative value of 80, and bran 70. Thus, oats are four-fifths and bran seven-tenths the value of oil-cake, that is, assuming they are equally digestible, which is practically the case if the oats are crushed. Compared with oil-cake at the price you mention (9s. 6d. per cwt.), crushed oats would be worth 2s. 8d. per bushel (40 lbs.), and bran 1s. 2d. per bushel (20 lbs.), so that oats at the price you mention, viz., 1s. 9d. per bushel, are by far the most economical feed, but for milking cows they must be crushed.

DYSENTERY OF BEES.—R.V. writes :—"I have three colonies of bees, in an out apiary of forty colonies, affected with what seems to be dysentery. The bees spot the entrance and alighting board with a yellow stain, and, if the cover is taken off, or they are disturbed in any way, they eject this all over the frames. Also, they appear to uncap the honey indiscriminately, as if they were gorging themselves, the combs getting quite sticky."

Answer.—The symptoms are those of dysentery, but, as you do not describe the dead bees, the trouble might also be paralysis. The difference in appearance was given in the August issue of this *Journal*, page 500. The indiscriminate uncapping of sealed honey is a sign that the honey is of doubtful character as bee-food, and the lacerating of the cell-caps is done in searching for something better—a comb often contains two or more varieties of honey scattered about in patches. Unsuitable food is the cause of dysentery. Remove all combs which contain no brood, and put empty combs in their place. Feed inside the hive, a little every day, a warm syrup, made by dissolving sugar of the best quality in an equal weight of boiling water; stir continuously while on the fire until dissolved and quite clear. Whether the ailment is dysentery or paralysis this is the best treatment. No disinfectants are needed, but in the case of paralysis the queen should be replaced as soon as possible.

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THE PIG AS A PROFITABLE ADJUNCT TO DAIRY FARMING.

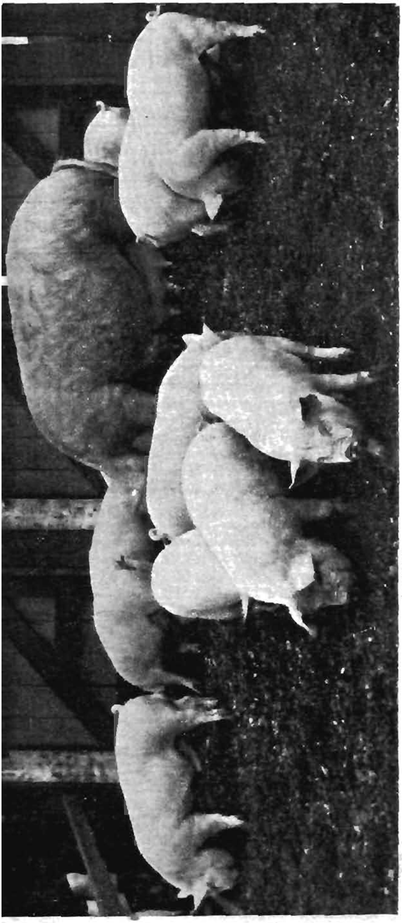
J. M. B. Connor, Dairy Supervisor.

It is surprising to find what a limited attention is given to the pig industry in Victoria as compared with other countries. Dairymen, generally, do not appear to realize the great possibilities of this important industry. Denmark has 32 factories, capable of treating 1,000,000 pigs annually, realizing a total revenue of £3,500,000; whilst, in the United States, the number of pigs kept totals 58,000,000, their value being estimated at £67,000,000. The exports of pork products from the latter country are valued at £12,000,000 per annum. In 1908 there were 211,002 pigs kept in Victoria, as against 273,682 in 1906, showing a decrease of 23 per cent.

No other stock kept on the farm will give such handsome returns in so short a time as a good sow. A good brood sow, provided she receives proper treatment so as to keep her in a thrifty condition, will farrow two litters of pigs in a year; these will run from eight to twelve pigs in each litter. If properly fed and cared for, the young pigs should be ready for market by the time they are four or five months old at the latest.

The business of pig-breeding in Victoria has generally been conducted in an unmethodical manner, and there has been lacking that persistent care and determined adherence to the principle of breeding which have rendered the best efforts in establishing the most popular existing breeds of other farm animals so successful. To illustrate that the rearing of pigs is a most profitable adjunct to dairy farming, one has only to take into consideration the prices realized for suckers and pigs generally at the auction sales held during the recent Royal Agricultural Show.

Mr. Edward Jenkins, of "Stephenhurst," Korumburra, who obtained first prize for the best Yorkshire sow and litter, with his beautiful sow, "Aurum" and litter of twelve suckers, realized the total sum of 77 guineas, the boar pigs bringing as high as 10 guineas, and the sow pigs up to 6 guineas. Mr Jenkins also exhibited the Berkshire sow, "Lady Dorothy," and secured second prize for sow with litter. She has had two litters, each of seven pigs, during the past twelve months. The owner kept four of the best sow pigs for future breeding, and sold three for 31 guineas. The last litter sold at the Royal Show, consisting of six boars and one sow, realized 62 guineas,



YORKSHIRE SOW, "AUBURN" AND LITTER.

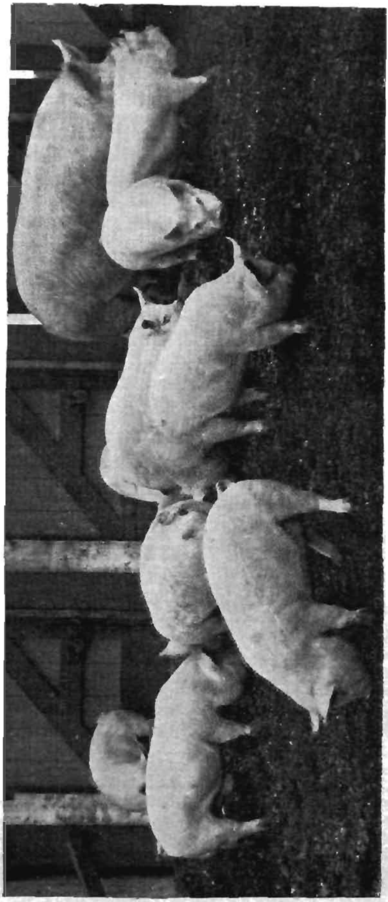
the boar pigs *making as much* as 19½ guineas, *and the only sow* in the litter, 10 *guineas.*

Mr. Jenkins informed me that he found pumpkins the most profitable feed for his brood sows when they are about to farrow. He considers it unwise to feed too heavily at this particular period, and believes in the sows having plenty of exercise, and, where practicable, *allowing them the* run of a handy clover and rye grass paddock. If kept in the stye, he maintains there is nothing better to keep the sows in good health than a double handful of bran, daily, in their feed. After farrowing, he finds English barley one of the best milk producers for the sow *suckling her* young.

This breeder is a firm believer in going in for a pure-bred pig, whether it be Berkshire, Yorkshire, or any other breed, but from his experience he finds the *pure Berkshires* develop quicker than any other. He

maintains that, provided they are properly housed and fed, they should dress at four months old from 80 lbs. to 90 lbs. in weight. He states that he has had them at 118 days old to weigh 116 lbs. when killed and dressed.

Mr. Jenkins is of opinion that sows should not be allowed to breed before ten months old, as it checks their growth, and generally weakens their constitution if allowed to become pregnant earlier. He considers from 9 to 10 young pigs are the most profitable litter, as they are quite enough for the sow to properly nourish. Young pigs should be weaned at eight weeks old. His idea of a piggery is a building 60ft. by 20ft., which should house 36 pigs. It should be divided into six styes, with a passage 4 feet wide on one side. The building should be high enough to carry a loft for bedding, and this will make it much cooler in summer and warmer in winter.



YORKSHIRE SOW, "WHITE ROSE" AND LITTER.

Mr. Frank E. Kurrle, of Jumbunna, who obtained second prize in the same class of Yorkshire sow and litter as Mr. Jenkins, with his sow, "White Rose," and litter of twelve suckers, states that "White Rose" is two years old, and that her litter of twelve suckers realized 108 guineas, averaging 9 guineas. The litter consisted of equal numbers of boar and sow pigs. One of the sows realized 16 guineas, and the highest boar pig sold for 12 guineas. Both

ANOTHER VIEW OF YORKSHIRE SOW "AURUM" AND LITTER.

Mr. Jenkins' and Mr. Kurrle's litters of pigs were sired by Mr. Kurrle's pure bred Yorkshire boar, "Jumbunna Chief." He says that this sire is the most profitable pig he ever owned. He has kept an account from time to time of all sows served, and the average is twelve and a half pigs per litter for ten litters, as follows, viz.:—

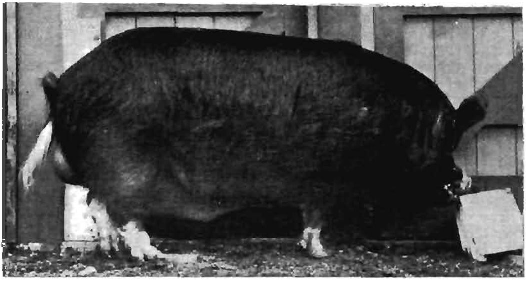
1st sow,	10 young pigs.		6th sow,	16 young pigs.	
2nd ,,	14	,,	7th ,,	12	,,
3rd ,,	12	,,	8th ,,	15	,,
4th ,,	10	,,	9th ,,	12	,,
5th ,,	12	,,	10th ,,	13	,,

BERKSHIRE SOW, "LADY DOROTHY."

Mr. Kurrle is a great believer in the pure Yorkshire on account of the sows being such good mothers, and rearing such large litters of pigs. He states that they are more profitable, that they grow into better bacon pigs, and, if looked after properly, will mature as porkers as soon as the Berkshire. In breeding, he always keeps the brood sows in good condition, and feeds heavily while they are suckling their young. It pays to keep the styes well bedded, and he maintains that "a good bed is half the feeding." He

states: "I do not give my sows about to farrow much bedding, as they are likely to smother some of the young ones. I make it a rule to watch the sows while they are farrowing, and give them a hand if necessary. One can tell pretty well when a sow is going to farrow by trying her teats for milk. She will always show milk from two to four hours before she farrows. I pet the young sows that I intend keeping for breeding purposes, and I find that, when they come to have young ones, they are not nervous or frightened when you go near them, and you can handle their young without disturbing them."

Mr. Thomas K. Adkins, "The Block," Korumburra, another successful exhibitor at the Royal Agricultural Shows, secured first prize for Berkshire boar, under twelve months, at the Royal Show, 1908, and first and champion prize this year with his typical Berkshire boar, "Invincible." This boar was afterwards sold for 28½ guineas, and Mr. Adkins also sold young sows up to 10 guineas each. His idea of successful pig breeding is to have small paddocks of rye grass and clover to run the pigs in, as exercise is essential to



BERKSHIRE BOAR, "INVINCIBLE."

keep the sows in good health. He states: "I do not believe in breeding from a sow until she is over ten months old. Two litters a year, I think, are sufficient, as more take too much out of the sow. My pigs do well on boiled potatoes, mashed with pollard and milk. When using all pollard I always scald it. I find carrots very good."

From the foregoing experience of practical breeders it would appear that both the Yorkshire and Berkshire pigs are notably and uniformly prolific, that they are kind and careful mothers (especially the Yorkshire sows) and copious nurses, qualities which are estimated highly by experienced breeders. They are well and favourably known for their great docility, and quiet habits, thus greatly diminishing the amount of care and labour necessary to keep them in their paddocks, besides enabling them to apply the food they consume to the laying on of flesh. This is one of the most important considerations to breeders, when one reflects on the uneasy movements of many of the lighter breeds of pigs. Being docile and of a quiet disposition, they are peculiarly susceptible to the influence of careful feeding, and under such influence make a most rapid and satisfactory gain in condition.

Regarding the best methods of feeding and fattening pigs, it would appear from the results contributed by the thirty practical farmers to the ***Australasian*** recently, that most of the breeders place a high value on peas and barley for fattening. Wheat is also praised by several. Pumpkins, carrots, sugar beet, and mangolds have their advocates. Lucerne and rape are recommended as pasture for stores and breeding sows. Several contributors contend that even pigs which are being fattened for market do better and fatten on less food when they have the run of some good pasture. Skim milk is also of prime importance in raising young pigs, and also in fattening.

"DEAD PATCH" IN MERINO SHEEP.

H. W. Ham, Sheep Expert.

"Dead Patch" is a fault on the top of the shoulder. It is found principally in merino sheep possessing a disposition to secrete yolk in excess, but this excess is not the cause.

Any unevenness of fleece can be traced to unevenness of ground from which the wool roots draw their nourishment. In merino sheep there is a close relationship between lean flesh and wool. When there is an excessive amount of fat between the lean flesh and the roots of the wool the latter is not of the best value. Merino sheep are of necessity a lean meat breed. On the other hand, good wool will not grow on hard bones —no more than an even yield of grain can be grown on stones. An even fleshed sheep is necessary to produce an even fleece.

The defect has come into prominence of late years to a greater extent than formerly, principally on account of the hasty rush into any sheep as long as they possessed wrinkles—all other good merino qualities were overlooked for a time.

The cause of Dead Patch is found immediately over that portion where the spinal column passes between the shoulder blades. It is always worse in sheep possessing open, loose shoulder blades. This part, being practically the meeting place of four portions of bone from different directions, is consequently hard to cover with flesh, and the defect shows when it is the nature of this type of sheep to secrete excessive yolk. Apart from excessive yolk, wet winters must be considered, for rain has its ill-effects also; water lodges, and is retained longer in this class of ill-formed shoulder.

The skin in this particular patch will usually be found of a very dark colour, while on parts where the wool is more attractive a healthy pink skin will be noticeable. The portion of the fleece that grows over this part of the carcase opens hard, and contains a gummy substance varying in colour from pale yellow to at times pink; it is really dead yolk. By many sheep men the droppings from gum trees in wet weather are held to be the cause. Owing to the bone having no flesh covering, this spot cannot secrete healthy yolk to feed the wool in a proper way, as in other parts of the same sheep. We rarely find unhealthy wool over the loins or about the upper parts of the hind-quarters, the two most meaty portions of a sheep.

Sheep in good condition that show Dead Patch slightly, if shorn closely and fed liberally immediately afterwards and kept so fed, can be made to grow wool correctly over the affected portion. Good spring feed and sunshine will do a great deal towards making this spot more fleshy, and also assist in causing the yolk to come through in a healthy

manner. In very bad cases of conformation no manner of feeding will correct it. Bad seasons will cause the defect to be more pronounced.

Merino sheep with the most even fleece on the back are invariably found with the most level made and even fleshed back when shorn. The late George A. Brown ("Bruni" of the *Australasian*) often advocated the further rejection off shears of a percentage of ill-shaped sheep, after being classed in the wool, and too few of our breeders yet realize the advantage of it. Attention to shape is more than ever necessary when we consider that flock merino ewes are the foundation of our crossbreds, and that level made crossbred ewes are the mothers of our most presentable export lamb carcases. A flat-sided, high, sharp-shouldered sheep is one extreme, one with open, loose shoulder blades, the other.

REGULATIONS FOR FARM AND CROP COMPETITIONS.

F. E. Lee, Agricultural Superintendent.

Under the conditions which regulate the annual allotment of the Government grant to Agricultural and Pastoral Societies, it is necessary that three out of four conditions shall be carried out. In addition to the examination of stallions and the holding of lectures or short course classes, societies have the option of either conducting an experimental plot or giving a special prize for a farm or crop competition.

In order that uniformity may be observed in the judging of farms and crops, and at the same time permit an accurate general opinion to be formed in regard to any specific detail of the competition, the following scale of points has been drawn up for use during the present season:—

FARM COMPETITIONS.

	Points.
1. The best subdivision according to the methods of farming adopted	10
2. The number of stock of all kinds on the farm	15
3. The area under cultivation and class of crops grown	20
4. The best provision for fodder conservation in the shape of silos, hay or straw stacks, and root crops	25
5. The condition of the fences, gates, yards, bails, pigstyes, barns, stables, &c.	10
6. The farm homestead and its arrangement, and convenience to outbuildings	10
7. The best provision for water supply for stock	15
8. The quality of the stock kept on the farm	20
9. The number and variety of farm implements and their shed accommodation when not in use	15
10. The best provision for tree planting or shelter belts of any kind for stock	10
Total	150

It will be observed that provision is made for evidences of progress in each department on a general purpose farm. It will probably occur that some competitors may give a greater amount of attention to crop production, others to dairying, or sheep keeping. The scale of points is sufficiently elastic to meet these variable conditions and permit a fair comparison between farms. It is worthy of note that the item carrying the highest number of points is fodder conservation by means of silos, hay or straw stacks, and root crops. No matter what a farmer's practice may be, his animals must be fed, and if he keeps only a few animals, then it is considered that his farming scheme is a poor one. The area and diversity of the cropping operations and the quality of the stock kept

are designed to ascertain the measure of a farmer's progress on modern lines. A narrow rotation of cereals only, with no inclusion of legumes, roots, rape, maize, sorghums, millets or grasses, means that the artificial manure bill must be higher than should be the case on a well-managed farm.

The number of stock kept, provision for their water supply and the care given to farm implements rank next in importance. The points awarded under these headings will illustrate the ideas of the farmer on stock management and economy.

Of the remaining points, the manner of working the different paddocks, the locality of dams, windmills, &c., the style and convenience of the dwelling and outbuildings, and the plan and maintenance of the same will afford farmers an opportunity of having a friendly unbiassed criticism. Tree planting, especially where needed in unsheltered open country, is a matter well worth the attention of all land-holders.

CROP COMPETITIONS.

Numerous societies will undertake crop competitions. In the majority of districts these will be confined to wheat or oats, and in a few localities to maize for green fodder and roots. The points obtainable are as follow:—

For cereal crops intended for grain—	
Freedom from wild oats and weeds	10
Purity of type	10
Freedom from smut, rust, take-all or whiteheads	10
Estimated yield per acre	1 point for each bushel
For cereal crops intended for hay—	
Uniformity of growth	10
Freedom from weeds of all kinds	10
Character of the straw and flag	10
Estimated yield per acre	10 points for each ton
For maize, sorghum, or millet crops grown for green fodder—	
System of planting	10
Variety of seed used	5
Character and number of cultivations given	15
Height of crops	10
Estimated yield of green fodder per acre	5 points for each ton
Root crops, such as sugar beet, mangolds, or turnips—	
System of planting	10
Kind and number of cultivations given	10
Estimated yield per acre	5 points for each ton

If competitions embracing other crops, such as lucerne, rape, potatoes or legumes, should occur, special conditions will be provided.

It is the desire of the Department of Agriculture that farmers shall enter for district competitions of the above character. The intrinsic value of the prize is worth much less than the credit of winning, and, moreover, the healthy spirit engendered by the competitions does much to promote progressive methods on the farm.

ANALYSES OF SAMPLES OF ARSENATE OF LEAD.

The question of the quality and efficacy of the various brands of Arsenate of Lead, which are now on the market, has been occupying the attention of the fruit-growers of this State, and the subject has aroused considerable interest. For the purpose of ascertaining the quality and genuineness of the preparations supplied to those engaged in the fruit industry, samples have been obtained from various sources by the Government Analyst and Chemist for Agriculture, who has submitted them to a careful analytical examination, and the result of the analyses is now published for the information of those concerned. All of the samples were found to be true to name, and little or no soluble arsenite was present. This may be considered to be very satisfactory, as, notwithstanding the high price of arsenic acid, there was no adulteration from the use of the cheaper arsenious acid. Comparing the analyses, it will be noticed that the moisture contents in the different samples vary considerably, and that, in almost all cases, a high moisture content is accompanied by a low arsenic acid percentage.

Included in the list of samples examined are two preparations made up by Inspector Hammond, of the Department of Agriculture. The first sample was made from the formula recommended by the Department; and the same formula was used in the preparation of the second sample, but the arsenate of lead was subsequently washed in order to rid it from certain chemicals, other than arsenate of lead, which are formed in the process of manufacture. The arsenate of soda used in the manufacture of these two samples was also submitted to chemical analysis, and the percentage of arsenic acid contained in it is shown in the statement.

Sample.	Received from.	Moisture.	Lead Oxide.	Arsenic Oxide.
		per cent.	per cent.	per cent.
Nicholl's	H. H. Davey	22·2	46·7	14·8
Jenkins' Austral ...	"	36·2	43·18	13·90
" " ...	Doncaster Fruit-growers' Association	50·1	31·63	11·02
Blyth's Blue Bell ...	" "	41·0	40·3	12·56
Swift's	" "	44·6	37·28	15·23
Platypus	" "	73·3	18·87	6·05
"	C. French, Government Entomologist	46·15	38·28	12·20
Federal	" "	45·90	33·80	14·70
Carlton (English brand) ..	" "	51·1	31·53	9·53
Ferguson, Glasgow ...	" "	44·4	27·29	13·8
Red Seal Brand	P. J. Carmody, Chief Inspector of Orchards	71·0	19·2	7·80
Grant, California ...	" "	37·9	44·96	14·46
First sample from Inspector Hammond*	" "	41·6	31·83	10·59
Second* " "	" "	36·0	41·60	13·76
Arsenate of Soda (Inspector Hammond)†	" "	...	...	53·2

* Two samples made from Departmental formula—No 1. without treatment, No. 2 washed.

† Arsenate of Soda used in making preparation.

P. RANKIN SCOTT,
Government Analyst for Victoria.

11th November, 1909.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.							
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
			%	%	%	%	%	%	%	%	%	%	%
628	Blood Manure	J. Cooke and Co., Melbourne .	15.03	11.93	11.98	..	..	..	..	..	..	1.08	1.50
585	,, ,, ...	Mt. Lyell M. and R. Co., Melbourne.	11.46	7.41	7.50	..	..	..	..	..	..	1.95	..
629	,, ,, ...	,, ,, ,, ,, ..	13.21	7.34	7.50	..	..	..	..	..	..	1.00	..
625	Superphosphate, Florida ..	Cuming, Smith and Co., Melbourne .	12.31	..	..	16.00	17.00	2.35	1.00	3.67	2.00	22.02	20.00
659	,, ,, ...	,, ,, ,, ,, ..	11.71	..	..	16.42	17.00	1.35	1.00	4.13	2.00	21.90	20.00
626	,, ,, Japan ..	A. H. Hasell, Melbourne	11.92	..	..	18.24	18.00	2.62	1.00	0.19	1.00	21.05	20.00
632	,, ,, ,, ..	,, ,, ...	8.14	..	..	17.67	18.00	2.33	1.00	1.17	1.00	21.17	20.00
524	Superphosphate, No. 1 ..	Mt. Lyell M. and R. Co., Melbourne..	10.04	..	..	18.85	17.00	1.88	1.00	3.20	2.00	21.93	20.00
668	,, ,, ..	,, ,, ,, ...	9.34	..	..	16.45	17.00	2.46	1.00	1.27	2.00	20.18	20.00
621	,, ,, ..	Wischer and Co., Melbourne .	6.79	..	..	15.22	17.00	2.39	1.00	3.44	2.00	21.05	20.00
645	,, ,, ..	,, ,, ,, .. .	7.42	..	..	15.25	17.00	2.37	1.00	4.13	2.00	21.75	20.00
652	,, ,, ..	,, ,, ,, ...	7.92	..	..	15.83	17.00	2.25	1.00	4.12	2.00	22.20	20.00
638	Bonedust and Superphosphate	S. Bugg, Kyneton.. .. .	9.85	0.91	..	11.65	..	5.96	..	2.59	..	20.20	..
678	,, ,, ,, ..	J. Cockbill, Melbourne	9.97	0.96	1.30	12.23	12.64	4.46	2.49	4.55	4.89	21.24	20.02
551	Bonedust and Superphosphate, No. A	Cuming, Smith, and Co. .. .	8.03	1.45	1.50	7.49	8.50	5.29	0.50	9.52	10.00	22.30	19.00
559	,, ,, ,,	.. ..	7.66	1.45	1.50	12.67	8.50	3.28	0.50	4.68	10.00	20.63	19.00
587	,, ,, ,,	. .. .	7.92	1.85	1.50	8.47	8.50	6.68	0.50	7.05	10.00	22.20	19.00
592	,, ,, ,,	.. .. . .	8.17	1.57	1.50	6.34	8.50	7.04	0.50	9.57	10.00	22.95	19.00
614	,, ,, ,,	.. ..	7.97	1.68	1.50	9.06	8.50	6.43	0.50	5.61	10.00	21.10	19.00
616	,, ,, ,,	.. ..	8.86	1.43	1.50	8.68	8.50	7.85	0.50	6.07	10.00	22.60	19.00
644	,, ,, ,,	.. .. . .	8.95	1.50	1.50	6.81	8.50	7.55	0.50	5.82	10.00	20.18	19.00
654	Bonedust and Superphosphate, No. C	.. ..	8.02	1.05	0.75	8.26	12.75	5.49	0.75	9.30	8.00	23.05	19.50
627	Bonedust and Superphosphate	J. R. Elsworth, Ballarat . ..	7.49	1.83	1.50	7.65	..	7.40	..	5.82	..	20.87	19.00
544	,, ,, ,,	A. H. Hasell, Melbourne . ..	6.96	1.66	1.50	8.50	9.00	4.19	2.50	7.89	9.00	20.58	20.50
568	,, ,, ,,	.. ..	7.29	1.01	1.50	9.65	9.00	4.06	2.50	7.59	9.00	21.30	20.50
574	,, ,, ,,	.. .. ..	6.98	1.33	1.50	11.55	9.00	3.68	2.50	5.47	9.00	20.70	20.50

520	Bonedust and Superphosphate, No. 1	Mt. Lyell M. and R. Co., Melbourne ..	8.28	1.35	1.50	7.83	8.50	3.98	1.50	8.75	9.00	20.56	19.00
534	" " "	" " "	6.91	1.18	1.50	6.96	8.50	4.87	1.50	8.94	9.00	20.77	19.00
537	Bonedust and Superphosphate, No. 3	" " "	6.06	0.85	0.80	11.83	12.75	3.58	1.00	6.16	6.75	21.57	19.50
549	Bonedust and Superphosphate, No. 1	" " "	7.27	1.45	1.50	8.05	8.50	4.20	1.50	9.47	9.00	21.72	19.00
642	" " "	" " "	7.27	1.33	1.50	6.77	8.50	4.06	1.50	9.68	9.00	20.51	19.00
636	Bonedust and Superphosphate	P. Rohs, Bendigo	8.36	2.54	2.63	5.08	9.24	10.60	5.85	5.48	7.01	21.16	22.10
581	" " "	Wischer and Co., Melbourne ..	9.22	1.57	1.50	7.67	8.50	6.78	0.50	5.25	10.00	19.70	19.00
546	Dissolved Bones	*Cuming, Smith, and Co., Melbourne* ..	7.44	0.95	1.00	11.03	10.01	2.91	3.88	8.48	5.48	22.42	19.37
560	" "	" " " " ..	6.70	0.86	1.00	10.50	10.01	3.80	3.88	8.96	5.48	23.26	19.37
665	" "	" " " " ..	9.70	0.93	1.00	8.38	10.01	4.70	3.88	9.09	5.48	22.17	19.37
611	" "	" " " " ..	7.82	0.95	1.00	12.27	10.01	4.58	3.88	5.45	5.48	22.30	19.37
547	Nitro Superphosphate ..	Aust. Explosives and Chemical Co., Melbourne	7.99	1.01	1.10	12.14	13.00	3.35	1.00	3.07	5.00	18.56	19.00
669	" "	" " "	8.32	1.01	1.10	9.17	13.00	5.67	1.00	5.00	5.00	19.84	19.00
554	" "	Cuming, Smith, and Co., Melbourne..	13.25	1.45	1.39	14.18	14.28	2.96	0.84	2.56	2.22	19.70	17.34
567	" "	A. H. Hasell, Melbourne	9.82	0.69	1.35	15.94	15.44	2.97	0.72	1.94	2.89	20.85	19.05
550	" "	Kitchen and Sons, Melbourne ..	15.00	1.18	1.39	16.49	..	1.59	..	1.61	..	19.69	17.34
562	" "	Mt. Lyell M. and R. Co., Melbourne..	10.72	1.60	1.60	10.65	13.00	3.78	1.00	2.40	2.00	16.83	16.00
656	" "	" " "	6.89	1.98	1.60	10.02	13.00	4.23	1.00	2.37	2.00	16.62	16.00

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.			
								Fine.		Coarse.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
			%	%	%	%	%	%	%	%	%
670	Bonedust, Federal	Aust. Explosives and Chemical Co., Melbourne	9.96	3.05	3.00	20.48	18.00	33.50	35.00	66.50	65.00
679	" "	" " "	6.05	2.85	3.00	19.97	18.00	38.00	30.00	62.00	70.00
653	Bonedust	Cuming, Smith, and Co., Melbourne ..	8.04	2.22	3.00	16.79	18.00	43.40	35.00	56.60	65.00
686	"	H. J. Feore and Co., Braybrook ..	9.59	3.18	2.43	16.29	16.28	52.00	64.50	48.00	45.50
683	Magic Fertilizer	G. Gardiner, Geelong	11.83	1.84	3.00	9.09	13.00	43.30	30.00	56.70	70.00
580	Bonedust	Wischer and Co., Melbourne	9.60	3.26	3.00	20.81	18.00	47.70	30.00	52.30	70.00

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.	
				Found.	Guaranteed.	Water Soluble.		Citrate Soluble.		Insoluble.		Total.		Found.	Guaranteed.
						Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	%	%
531	Special Grain Manure ..	Aust. Explosives and Chemical Co., Melbourne	7.79	..	..	15.20	16.50	3.00	1.00	2.10	2.00	20.30	19.50	0.75	0.75
508	Special Mixture ..	Cuming, Smith, and Co., Melbourne	2.02	..	..	..	..	6.71	7.00	2.64	1.50	9.35	8.50	8.23	8.46
602	" "	" " "	6.74	1.18	1.00	6.20	5.66	5.15	0.33	3.15	6.66	14.50	12.65	18.52	19.59
646	Onion Manure	" " "	9.77	1.91	2.00	12.87	13.60	2.73	0.80	3.40	1.60	19.00	16.00	4.60	3.95
661	Special Vine Manure ..	" " "	10.09	1.38	1.25	9.96	10.65	4.38	0.65	3.86	5.70	18.20	17.00	7.00	6.64
666	Rape Manure	" " "	10.12	1.51	1.30	17.07	14.28	1.65	0.84	1.78	2.22	20.50	17.34	..	..
655	Potato Manure	Mt. Lyell M. and R. Co., Melbourne	4.80	1.05	1.20	12.21	14.50	3.34	1.00	2.05	1.70	17.60	17.20	3.98	4.15
519	Rape Manure	Wischer and Co., Melbourne ..	6.02	2.07	1.05	9.37	8.50	3.23	0.50	2.35	7.30	14.95	16.30	8.60	7.78

Government Laboratory,
Melbourne, 11th November, 1909.

P. RANKIN SCOTT,
Acting Chemist for Agriculture.

GRAPE STEMMERS.

AUSTRALIAN AND FRENCH TYPES COMPARED.

F. de Castella, Government Viticulturist.

When one compares the grape crushing and stemming machinery in use in European wine countries with that made and generally used in Australia, one cannot fail to be struck by a fundamental difference in construction between the two which is, in my opinion, of sufficient importance to merit the serious consideration of our growers. This difference lies in the form of the movable or working portion of the stemmer proper.

Both French and Australian stemmers (*egrappoirs* as they are termed in the former language) consist of a non-movable half cylinder, generally known in Australia as a "concave," made of perforated metal, in which the separation of the grapes from their stalks takes place. In the axis of this half cylinder turns a spindle to which are fixed beaters, which, by throwing the grapes violently about cause the berries to fall through the perforations, whilst the stalks move forward and are evacuated at the opposite end of the cylinder to that at which the grapes enter the machine

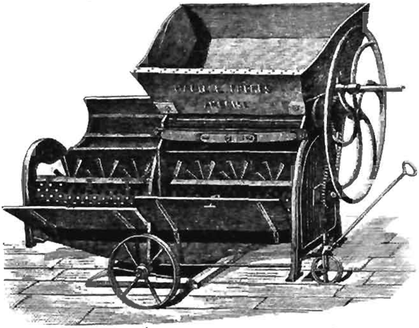


FIG. 1. MABILLE'S GRAPE CRUSHER AND STEMMER.

It is in the form and nature of these beaters, that the radical difference between the French and Australian machines is to be found. In Australian machines the beaters consist of oblique, but continuous, wooden bars, set so as to form an acute angle with the plane in which the axis of the spindle is situated. These beaters, usually to the number of four, move at a very short distance from the perforated "concave" against which they literally rub the grapes, separating and pushing them through the perforation. The small angle at which they are set, causes the stalks to move forward towards the end where they are thrown out. In French machines the beaters, instead of being continuous, consist of a series of pegs fixed into the spindle, around which they form a spiral or helicodal row, this arrangement serving the same purpose as the oblique set of our beaters, viz., to make the stems move forward towards the exit.

The difference between the action of the continuous beaters which rub the berries off, against the perforated plate or "concave" and that of the helix of pegs which toss or whisk the stalks out of the crushed mass, is very evident. In the former case, it not infrequently happens that a considerable proportion of the stalks thrown out at the end of the cylinder are more or less completely shredded. In the French machines, the stalks coming away from the exit are remarkably little damaged, being scarcely more than stripped of their berries.

According to analysis* the composition of the stalks does not appear very different to that of the skins but if one chews a small fragment of stalk a marked difference is noticeable. Both contain tannin in not very different proportions but, in addition to this normal constituent of all red wines, the stalks also contain resinous and acrid substances capable of communicating an unpleasant taste to the wine. The breaking of the outer bark permits these substances to dissolve freely out of the broken fragments, many of which easily find their way with the crushed grapes into the fermenting vat.

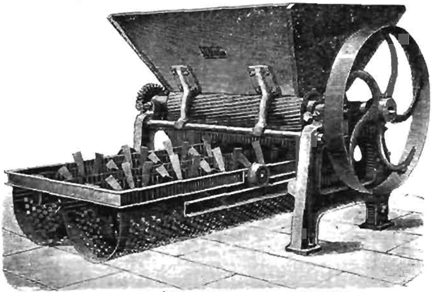


FIG. 2. COQ'S CRUSHER AND STEMMER.

In old days in Australia, when stemming was done with rakes or riddles and was therefore not very complete, it was customary on some vineyards to press these stalks in order to avoid loss of juice; the resulting wine, known as *Grappe*, possessed a marked unpleasant taste of its own, rendering it useless except for distillation. This peculiar flavour rendered this "grappe" far more unpleasant than even the "hard press" resulting from the final pressings of the fermented skins in which tannin was the substance chiefly in evidence but in which it was not accompanied by the unpleasant stalky or "grassy" taste above referred to.

I think most people who have considered the subject will agree that the shredding of the stalks is undesirable to say the least, and the difference between the French stemmers, remarkable for freedom from this defect, and our locally made ones is certainly worthy of note.

It is somewhat curious that a type of stemmer with pegs instead of beaters has not yet been manufactured in Victoria, notwithstanding the fact that several imported machines have long been satisfactorily worked on some of our vineyards. Nearly all the locally made machines are on a similar pattern to the "Fraser" mill which was first placed

* See Roos—*Winemaking in Hot Climates*, p. 31.

on the market here about 1880 and which, owing to the satisfactory work it performed, so far as removing the stalks from a large quantity of grapes is concerned, rapidly became very popular. And yet the continuous beaters were abandoned at an early date in France. It was, in fact, only in the very earliest French machines that they were used—in that, for example, of Bouilly (Bordeaux), first made in 1861. As early as 1867, however, Abbé Laporte introduced a machine with a spiral row of pegs, and this appears to have been the prototype of all modern French stemmers. In 1879, M. Gaillot, of Beaune (Burgundy) brought out the machine which this firm is still manufacturing, with but slight modifications, at the present day. The late Baron de Pury imported one of the Gaillot stemmers nearly thirty years ago. This machine is still working at Yeringberg vineyard and is in excellent order, showing scarcely any signs of wear.

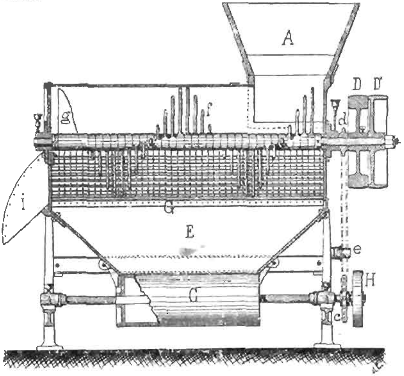


FIG. 3. ROY'S STEMMER AND CRUSHER.

There are, as might be expected, many different French makes on the market differing somewhat, but having, as a common feature, the helix of pegs instead of continuous beaters. Fig. 1 shows one of Mabille's stemmers. This well-known firm make several different models; that figured here is one of their smaller sizes. In Fig. 2 is to be seen a Coq machine of larger size, capable, with its double stemmer, of treating a very large quantity of grapes per hour.

It will be noted that in these two machines the grapes are crushed before being stemmed. This is by far the more usual way in French machines. Much discussion has taken place as to whether stemming should precede or follow crushing. Although some authorities prefer the former method, which is in fact the oldest idea, the practical advantages, except in the case of making white wine from red grapes, do not seem very marked; stemming is more easily and completely performed if the grapes have first been crushed, for which reason the latter method has, until recently, been almost the universal rule in France.*

* See M. Charvet in *Revue de Viticulture*, Vol. XV., p. 519.

Fig. 3 shows Roy's machine, introduced in 1890, in which stemming precedes crushing as in Australian machines.

Fig. 4 will give some idea of the working portion of the Gaillot stemmer—the photograph, which is a portion of the machine at Yeringberg already referred to, shows the actual appearance of the spindle and pegs. The following dimensions may prove of interest:—Concave 4 ft. 3 in. long and 18 inches diameter; spindle 1½ inch in diameter, teeth or pegs ½ inch iron 7⅞ inches long; distance apart (centre to centre) 1 7-16 inch. There are two spiral rows of pegs exactly opposite to each other, each of which makes two complete turns in the length of the spindle. The pegs are flattened out to a blade about 1⅛ inch wide for the half of their length furthest away from the spindle. They are so set on the spindle that the flattened blade is in the same plane as the spindle; in other words, they are not set obliquely, as might be expected. The three last pegs of each row are joined by a small iron plate 6 inches x 3 inches which, owing to its oblique set, throws out from the cylinder such stalks as have reached the end. The "concave" is made of gun-metal with holes about 1 inch in diameter. The Gaillot machine

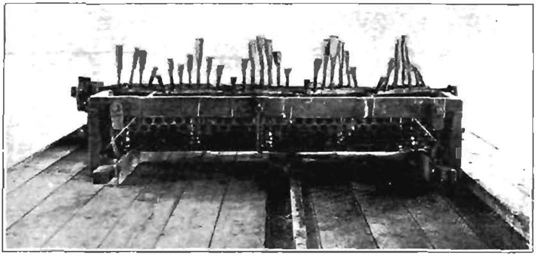


FIG. 4. WORKING PART OF GAILLOT'S MACHINE.

is of the same type as Mabille's and Coq's, crushing being performed before stemming. The size in use at Yeringberg is able to treat about 2 tons of grapes per hour.

* * * *

The object of the present article is to bring the matter under the notice of those interested in sufficient time to permit of their making alterations for the coming vintage, should they desire to do so. The writer has had occasion to discuss the matter with several growers, both in this State and South Australia. One of these, who found fault with the shredding of the stalks which he had observed, was of opinion that the countersinking of the holes in the "concave" from the inside, so that there would be no sharp edges for the bunches to be rubbed against, would obviate the trouble. This would no doubt be an improvement, but the alteration of the spindle to something like those used in French machines, will doubtless be found more satisfactory and probably simpler. *Roy's machine (3) shows that it will not be necessary to alter the mill in such a way as to make crushing precede stemming in the usual French way.*

* * * *

It does not seem to be realized by many of our growers that the removal of stalks prior to fermentation is not nearly so general an operation in Europe as it is with us. The majority of the red wines of France and other countries are merely crushed; juice, skins and stalks fermenting together in the vat. This does not only apply to the cheap vin ordinaire of the South of France but also to several choice red wines. The clarets of the Medoc must of course be excepted. In this district, stemming (*egrappage*) has long been the invariable rule, but such wines as Burgundy, Hermitage, Beaujolais, &c., are, at the present day, fermented at least partially on their stalks, and this for the express purpose of improving the quality of the wine. In this as in so many other points connected with wine-making, we find that operations suited to one district are not necessarily so in another. The whole question is one which has given rise to much discussion and concerning which leading authorities frequently hold opposite views.

This is not the place for the discussion of the question as to whether stemming should be total, partial, or discarded altogether—those interested are referred to Roos, *Winemaking in Hot Climates*, where they will find the arguments for and against stemming concisely set forth.

Taken as a whole, perhaps, the weight of most modern evidence is in favour of stemming. The process has at any rate received the unanimous approval of our Australian winemakers and departures from established methods are only to be cautiously tried. At the same time, it appears probable that the same causes which have led to the rejection of the stalks prior to fermentation will cause the adoption of a stemmer more after the French pattern to have a beneficial influence on the quality of the red wine produced from grapes treated with it.

When in South Australia recently, in course of a conversation where the shredding of the stalks was referred to, one intelligent grower expressed the opinion that grapes fermented on their stalks had yielded him a less stalky wine than those shredded by a faulty mill.

It used to be freely stated that the best wine was that crushed with the feet. It would certainly be difficult to find a greater contrast than that existing between the foot crushing of ancient times and the rough handling to which the fruit is submitted in a faulty stemmer in which the stalks are torn and shredded.

VINEYARD CULTIVATION.

DEEP *versus* SHALLOW PLOUGHING.

The following letter was recently received from Mr. J. M. Alexander and was referred to the Government Viticulturist (Mr. F. de Castella), who has furnished the accompanying notes:—

In the *Journal* for September I see that Mr. Cronin, in the "Orchard Notes," condemns such ploughing as damages the roots of trees. I notice when ploughing in my vineyard that the vines are frequently cut. I should be glad if the Government Viticulturist would kindly inform me if, when the root of a vine is cut by a plough, any serious injury is done to the vine or whether the root renews itself, where broken off. It is important to know definitely whether old vines renew their roots when they are damaged in the same way as they put forth fresh shoots on their branches when a limb is severed. It does not by any means follow that they will do so, but accurate observation of the habits of vines and trees must have established whether roots have the power of renewing themselves if they are broken by a plough or otherwise. If it is true that fresh roots are thrown out by the plant no harm would result, as by destroying surface roots the plant would be induced to throw out roots at a deeper level where more permanent moisture is obtainable."

Mr. Alexander, in his letter, raises several interesting points of vegetable physiology, concerning some of which but little experimental investigation has as yet been carried out.

When a root is cut, it certainly renews itself, but its renewal would not necessarily occur in the same way as happens above ground when a limb is severed. Below ground, instead of forming one main root to replace the portion it had lost, the vine would be more likely to throw out a bunch of small rootlets. These would not penetrate to the same distance as the suppressed part and for some time, at least, their power of supplying moisture and plant food, would be less. It is questionable whether this bunch of roots would, even after a considerable lapse of time, perform its functions as satisfactorily as the original root. It has long been held by viticultural authorities that a vine planted as a cutting is of more robust constitution than one planted as a rootling—in the case of the latter, the roots which were necessarily cut back on transplantation would throw out a less normal system than that provided by the original cutting. The vine planted as a cutting would be more similar to a vine grown from seed—the natural means of reproduction of the plant, and therefore the normal one. These remarks apply to the principal roots of the vine.

It must be remembered that the root system of the vine is made up of two groups, viz., surface feeders, which absorb the bulk of the plant food substances—mainly at an early period of the yearly cycle of growth—and deep roots, which chiefly serve to supply the necessary moisture in dry weather. The latter perform their functions throughout the summer.

Analysis shows that, in the great majority of our soils, the surface is richer than the subsoil, at least in nitrogen and often in phosphoric acid also. As regards potash, the contrary is frequently the case—especially where the subsoil is clayey. Abundance of the first-named elements would tend to promote active root growth in the more superficial layers.

The influence of climate must be taken into account; the feeding roots of the vine are, no doubt, situated at a greater depth in arid districts than in moist ones.

The system of cultivation must also be considered. In most of the warmer European wine districts deep cultivation (7 inches to 9 inches), at least once a year, is the rule, supplemented by shallow scarifyings. This would prevent the development of roots near the surface.

The case of a plot of vines, regularly submitted to such treatment and therefore not permitted to have a superficial root system, is of course, very different from one which is never ploughed deeper than 4 or 5 inches, as is the case in many of our vineyards. In the latter case, the vines would most probably suffer after an exceptionally deep ploughing, at least during the first season.

The question of the best depth for cultivation has received a considerable amount of attention in Europe recently, as the outcome of the opinions of M. Oberlin, of Colmar, who strongly recommends shallow cultivation.

Professor Ravaz of Montpellier published, in 1905, an important work on the whole subject, resuming its history and giving results of

experiments conducted by himself and others. His conclusions may be here translated. They are as follow :—

"1. Young vines, from the time they are planted until they are three years old should receive good ordinary cultivation.* The first roots, in fact, all originate deeply and it is of the highest importance to facilitate the aeration of the layers in which they develop.

"2. As regards older vines, experience has proved, so far, that shallow cultivation is preferable to deep in all soils which are compact, moist or medium. It must not be forgotten that it is only fully effective when it prevents the growth of weeds. Shallow cultivation has shown itself equally advantageous in sandy coast soils, very dry at the surface, but where the water level is usually found at small depth.

On the other hand, the calculations we have made, and experience show, that in dry, pebbly, penetrable soils where the water level is deep, where for this reason, the roots tend to establish themselves in the lower levels, deep cultivation is still indicated and should give better results than systematically shallow working."

Root pruning frequently has a beneficial effect on the yield—it is well known that one of the first effects of phylloxera is to cause the vines (in the first stages of the invasion) to bear a very heavy crop of grapes.

The exact border line where interference with the root system by cultural implements would begin to exert an injurious influence is difficult to definitely fix. In these matters common sense is the best guide and, in a general way, it may be said that the cutting of a considerable number of surface roots of vines which had previously only been ploughed shallow would have an injurious influence on the vegetation during the following season. In moist districts the cutting of surface roots, to any extent, is to be avoided. In arid districts it will be better to prevent the formation of surface roots by a fairly deep ploughing at least once a year from the time the vines are quite young, supplemented, of course, by the usual spring and summer scarifying.

THE PRICKLY PEAR.

Senator James H. McColl.

The September issue of the *Journal of Agriculture* contains an article on the Prickly Pear, which purports to give an account of the facts definitely known in regard to this plant. One authority only is quoted in the article. *The Farmers' Bulletin*, No. 72, of the U.S.A. Department of Agriculture. It is, however, somewhat ancient, having been issued in January, 1898. This Bulletin was on "The Cattle Ranges of the Southwest, the Exhaustion of the Pasturage and Suggestions for its Restoration," the only reference in it to the Prickly Pear being the one quoted. The spread of the pear was but one of many reasons given for the exhaustion of the pasturage, but no reference is made to getting rid of it, it being stated "it was, *on the whole*, detrimental to stockmen," inferring that, to some extent, it was of use. It is strange that, in an article professing to give an up-to-date account of this plant, reference is made to such an old paper, and all the later literature, which is of considerable extent, entirely ignored. The limitation of space prevents me dealing so fully with the subject as I would like, for much that readily applies must be omitted.

Probably no plant has had such contradictory opinions expressed about it as the Prickly Pear. Reviled in one place, blessed in another, utilized here, banned there, bringing destruction in one country, proving the salvation of the settler and his herd in another. Much has been written in praise and in blame, but research and experience have increased knowledge

* In the south of France this would be to a depth of 7-9 inches.

regarding it, and practical tests, which are still being continued, are placing that knowledge on a sound foundation. And it is to practical men who, by virtue of their profession or business, have applied themselves to the investigation of the plant, and not mere theorists and book students, that we must look for sound information. It is not a matter of personal interest or gain to myself, my sole object being to try and assist Australia in making her arid wastes economically useful, and preventing the deplorable loss of stock caused by the droughts, which periodically afflict portions of this continent.

It was while passing through Queensland in January last on my way to attend the Dry-Farming Congress at Cheyenne, Wyoming, U.S.A., that some leading men asked me to make inquiries into the Prickly Pear, which had been allowed to overrun and impair so much land in that State, and for the eradication of which a reward is offered, and land granted on merely nominal terms. In pursuance of this request, and at my own charges, I visited California, Arizona, New Mexico, Texas, and had communications, oral or written, with most of the authorities who had been studying this question and dealing with it. The result of my investigations, I shall, in the briefest possible manner, submit.

But first it may be well to dispose of the mythical statement that Luther Burbank, the wonderful plant scientist, claims to be the discoverer, inventor, or creator, of the spineless Prickly Pear. Such an idea can only be entertained by those knowing nothing of the subject. Mexico is the most important Prickly Pear country in the world, and the plant is so valued there that it is emblazoned upon the coat of arms of that Republic. There is "spineless" Prickly Pear found in parts of California, Arizona, Texas and Florida. Since this plant began to attract the attention of the scientists of the Department of Agriculture, which is within the past six years, 25 of the "spineless" varieties have been imported by the Plant Bureau of the Department. These have come from Mexico, the European, Asiatic and African shores of the Mediterranean, the Hawaiian Islands, South America, while they are known to grow in South Africa, Australia, and some of the Pacific Islands. What Luther Burbank did, was to take the spiny and spineless pears; and after twelve years' experimentation, by cross-breeding, fertilization, and pollenization, he has combined the valuable attributes of the plant and eliminated the bad ones, until he has produced a plant free from spines and spicules, bearing a delicious fruit, and yielding about 100 tons of stock food to the acre. I have seen the plants and tasted the fruit, and in years to come generations will rise and bless the name of the man who, by reason of his discoveries, robbed the arid places of some of their terrors, and helped to make the desert fit for the habitation of man and beast.

The attention of the Department of Agriculture, U.S.A., was drawn to the necessity of investigating the cactus plant some six years ago, and Dr. David Griffiths, the Assistant Agrostologist in charge of Range Investigations, has, in conjunction with Professors Hare, Wooton, and Mitchell, of the New Mexico Experiment Station, Messrs. William and Alexander Sinclair of San Antonio, Texas, and others, been devoting most of his time to this work. The results ascertained are set out in Bulletins Nos. 60 (1906) and 64 (1907) of the New Mexico College of Agriculture, and the following Bulletins of the United States Department of Agriculture, Nos. 74 (1905), 91 (1906), 102, and 116 (1907), 124 (1908), and 140 (1909). These Bulletins run from 16 to 120 pages and are devoted entirely to the consideration of the Prickly Pear and other cacti, to ascertain the uses they can be put to for man and beast. There are others issued by the Department, which I have not seen, as well as some from

the Arizona Agricultural Experiment Station, where Professor Thornber and others have devoted much time and study to the question. This Station is planting out the pear on the Ranges as a stock food. All the Bulletins can be obtained at a small charge by application to the institutions named.

The result of the inquiries I personally made have been embodied in a report by myself, issued by command of the Federal Parliament in July last. This report can be obtained by those interested through the Federal member for their district, or by application to the Secretary for External Affairs. There is no charge. The summary of the investigations and experiments made, show that this plant, formerly considered a pest, has been proved to be most useful as an emergency feed in time of drought, and has saved flocks and herds from destruction many times. It has also prevented the loss of the rancher's capital, the accumulation of a hard-spent life, in many instances. But not only has it proved an emergency feed, but has also been found, in conjunction with some kind of concentrated food, of use as a regular feed for cattle, sheep, and pigs. By singeing the spines off with a gasoline torch, the plant, which previously the stock would not touch, is made at once available for food, either by cutting it in pieces and feeding to the stock, or allowing them to feed on it standing on the range. Steaming was also done, but since the Gasoline Pear Burner came into use in 1898 burning off is mostly practised. The use of the pear increases the flow of milk in dairy cattle, and in many towns in Texas it is fed regularly, while Mexican families depend upon it for their cows as a mainstay. It has not a great feeding value, but is esteemed for its succulence. It is fed together with cotton seed meal, or brewer's grains, or bran, or other concentrated food, and if a properly balanced ration is used the milk yield is equal to what it is from grass. A gentleman in Adelaide, whom I do not personally know, advised me that, seeing in the paper my account of this plant, and having a paddock of 15 acres near him, on which were patches of Prickly Pear, he cut some down. Cutting off the spines with a pair of strong curved shears he chopped the leaves in pieces and fed it to his cow with some chaff; the feed bin held from two to three kerosene tinsfull, and he writes "It is really wonderful how well during the last eight or ten days that my cow has been given this food the extra quantity and quality of the milk have improved." It has also been fed to sheep and goats, and in some parts of Texas and Mexico to a great extent to the working cattle. A full ration of pear scours animals, especially at first, but balancing the ration as before stated, or even with sorghum, hay, or dry grass, modifies that condition.

So great has been the change of opinion in regard to this plant in Texas, that while some years ago the Legislature was considering the passing of an Act to compel its eradication, the Department of Agriculture of the United States, issued on 19th February, 1908, Bulletin No. 124 on "The Prickly Pear as a Farm Crop" with instructions as to its cultivation and utilization. And this is not the "spineless" but the "Prickly" Pear. Cities in Texas have been cleared for 8 miles round of this plant for food, and dairymen and others now have to purchase it.

I could write much more, but consideration for your space compels me to stop. I trust I have stated enough to show that this question of the utilization of the cacti for a dry country like Australia cannot be brushed contemptuously aside, but must have the consideration of those who are responsible for the utilization of our extensive arid regions. I have by no means exhausted my facts, in fact, have merely touched upon them, and can return to the subject again if it is necessary to do so.

Bendigo, 11th October, 1909.

ORCHARD NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley

Keep the soil surface well stirred.
Spray for Codlin Moth, Pear Slug, and Vine Caterpillars.
Examine Codlin bandages frequently.
Begin Summer pruning.

SOIL TREATMENT.

The season has turned out, so far, unusually dry; and the high winds, both northerly and southerly, combined with the occasional hot spells, will have a very drying effect on the soil. Consequently, a soil condition of friability is absolutely necessary for the healthy growth of the trees. The soil surface should be cultivated as frequently as possible, especially after rain or irrigation. This is required to conserve the soil moisture. Soil in its natural and uncultivated state possesses the property of capillarity to a marked degree. Capillarity is that power which causes the moisture to rise upwards in the soil, similar to the manner in which water soaks upwards in a piece of blotting-paper, when the tip of the paper is held in water. This property is, of course, essential in soils, as by the upward soakage the soil water is brought upwards, and so made available for the tree roots. If the soil surface be uncultivated, the moisture rapidly rises to the surface, and is very soon evaporated. Ultimately, we see the soil cracked in all directions, having contracted by the drying process to which it has been submitted. The evaporation of soil moisture is prevented, or is considerably deferred, by keeping the surface soil in a loose, pulverable state; not too fine so that the particles will run together closely after a light rain, but fine enough to prevent any surface caking. A few inches of tilth is desirable, so as to destroy any continuous capillarity of the soil, and to allow the soil water to be made available for the use of the whole root system of the tree.

SPRAYING.

Spraying for codlin moth should be carried on now with unabated vigour, especially in the warmer regions of the State. It is only by constant watchfulness and continual spraying that it can be hoped to keep this pest in check. With good work, and with care, growers should be able to easily obtain a result of over 90 per cent. of clean fruit. While the fruit is growing, frequent sprayings will be necessary. After the fruit has reached its full size, the main point to be observed is to keep the fruit and foliage well covered with spray.

The old theory of the moth laying her eggs only on the fruit, and almost always in the calyx, has been entirely exploded. At the Burnley Gardens, up to the time of writing (17th November), on all observations, not one apple has been attacked at the calyx end, while a large majority of the codlin eggs observed have been found upon the upper side of the foliage. The first brood of moths is not especially prevalent this season, but these are more than ample to insure disastrous results from their progeny, should the December and early January sprayings be neglected. It cannot be urged too strongly that the more the later sprayings are observed the better the crop will be.

The question, "How many times should I spray to keep down codlin moth?" is frequently asked. This generally resolves itself into "How few times may I spray?" The number of sprayings should not be taken into

consideration at all. The greater anxiety should be to keep the pest away at all hazards, no matter how often the spray pump is taken out.

With ordinary care no grower should fear burnt foliage by using any of the brands of arsenate of lead now placed on the market. Continuous trials of various brands of colonially manufactured arsenates of lead are now being made at the Burnley Gardens, but very little difference in comparative results is expected, as recent analyses undertaken by the Departments of Agriculture of South Australia and Victoria show an equable proportion of arsenic oxide for killing purposes; further, the percentage of free arsenic, or water-soluble arsenic—the burning property—is low in all samples.

The results of the Victorian analyses are given on page 753, whilst the South Australian are as follow:—

	Moisture. per cent.	Lead. per cent.	Arsenic oxide. per cent.	Water soluble arsenic per cent.
Nicholl's ...	25.95	48.99	15.62	0.08
Blyth's Blue Bell	39.10	42.87	12.72	0.07
Jenkin's Austral	59.47	27.87	8.87	0.06
Swift's	47.10	35.66	15.17	0.35
Platypus ...	68.90	22.87	7.01	0.10

A Bill has been prepared for United States Congress, providing that arsenate of lead shall be deemed to be adulterated if it contains more than 50 per cent. of water; if it contains total arsenic equivalent to less than 12½ per cent. of arsenic oxide; or if it contains soluble arsenic equivalent to more than 0.75 per cent. of arsenic oxide. According to this standard, it is shown that some samples, as appear in the accompanying analyses, may be regarded as adulterated: but, at present, it may be considered that those samples which show a fair percentage of arsenic oxide, and a low percentage of water soluble arsenic, are the safest and best to use. The Government of South Australia is introducing legislation to deal with this question. A Bill has been drafted providing that manufacturers of insecticides shall deliver with the invoice an exact account and percentage of all constituents and ingredients of any insecticide sold.

Additional precautions to keep the codlin moth pest in check should be rigidly observed. All fruit infested with the larvæ, whether on the ground or on the tree, should be immediately collected, and burned or boiled, preferably the latter. If the trees are bandaged, the bandages should be examined, and existing larvæ destroyed weekly. All secondhand cases should be thoroughly steamed or dipped in boiling water, immediately they are brought into the orchard.

The pear and cherry slug should still be combated. So far as this insect affects the pear, growers who spray regularly for codlin moth with arsenate of lead need fear no trouble. It may again be emphasized that every effort should be taken to prevent the slug making any inroads upon the foliage of cherry trees. Hawthorn hedges are a source of harbour for this pest, and these should be kept cut within bounds, so that they may be easily sprayed if they become seriously infested. Japanese plums, and the purple foliaged *Prunus pisardi* (sometimes known as the Japanese cherry plum) should also be watched for visitations of the slug. Vines should now be sprayed with arsenate of lead, or with Paris green, for the destruction of the vine moth caterpillars. The usual early summer pest, the thrip, made its appearance with the hot spell early in November. The insects came in large numbers, but were too late to do any damage to fruit tree blossoms.

Summer Pruning.

Disbudding and pinching back shoots, so as to further strengthen and shape the trees and vines, should now be completed, and the work of summer pruning commenced. "Summer" or "Green" pruning is an operation which is not much practised in this State. Generally, the existing opinions on this subject are so vague that, even where it is performed, a small amount of an element of uncertainty is always existent in the mind of the operator. The principle of summer pruning is that the wood growth is reduced, so as to induce increased fruit production for the next season. The unnecessary wood is removed, and the sap is directed into other channels, strengthening and building up weak or immature fruit buds.

Summer pruning is exceptionally advantageous to young or to strong growing trees. Whenever a tree has been heavily pruned during the dormant season, a very fair growth of wood will ensue, and this wood is generally strong. To "stop" or summer prune this wood will have a very beneficial effect on the productiveness of the tree. Of course, if the growth be excessive and rank, a judicious selection will need to be retained, and the balance disbudded. The result of summer pruning will be that, wherever the growing shoot or lateral has been severed, the buds below the cut will receive the full benefit of the sap which previously went to nourish the wood which has been removed. If this operation were performed too early, the bud at the point of severance will merely push its way out, and continue the growth. This result is undesirable, as the very object we wish to attain is defeated, the sap being utilized in the production of new wood, and not in the strengthening and enlarging of the fruit buds. Sometimes even this end is desirable, but it is only when the lateral has been of an excessively strong nature, and an extension is desired, though only as a weak growth. Two points to be noted are:—First, the terminal ends of main, secondary and extension limbs should never be cut at summer pruning; secondly, the cut must always be made at a point where a leaf is existent, so that the sap may be furnished and perfected for the whole of the lateral. If the cut be not made at a leaf, the probability is that the tip of the lateral will lose its vitality, and ultimately die, owing to the fact that no foliage exists to draw and perfect sap for its nourishment.

A number of problems in fruit production and tree culture are still awaiting solution, and among these is the question as to the value of summer pruning on those trees which are supposed to be biennial croppers, such as the Rymer apple; or on such trees whose unproductiveness has been charged to the debit account of the stock they are worked upon. It is an accepted fact that unsuitability of stock will result in unproductiveness, but we might pause before we would say that non-production can always be attributed to unsuitable stock. Coe's Golden Drop plum, for example, is a tree that will not bear on an unsuitable stock; but sometimes trees of this variety have only been a partial success as fruit producers, even when on their supposedly correct stock. In a case like this summer pruning has been known to produce a marked increase of crop. The illustration shows a nine year old Coe's Golden Drop plum tree, a typical tree from a number in the orchard of Mr. A. S. Lowe, of Diamond Creek. These trees were never considered good bearers. In January of this year they were summer pruned, with the result that on every tree a very large number of new fruit buds were formed on almost every lateral, and the trees set a heavy crop of fruit from the blossoms shown in the photograph. At present, the heaviest crop ever known is on the trees. Of course, the year is a good one for plums; but even when this has occurred previously, the trees only had medium crops.

It should be definitely understood that summer pruning is not suitable for each tree every season. Growers must know their trees individually, *and also their individual requirements. A tree should be strong in constitution*, and growing strongly as well; and, as a general rule, a weak tree should not be summer pruned. Weak trees may be successfully treated by

COE'S GOLDEN DROP PLUM. SUMMER PRUNED JANUARY, 1909.

hard pruning in winter. A tree that is thriving prosperously, and bearing *systematically, needs very little or no summer pruning*; while a tree that is growing strongly, is in a good healthy situation, and is yet unfruitful, needs all the attention and consideration that summer pruning can give to it

The time for summer pruning is a consideration that cannot be settled by any general rule. So much depends on the state of the tree, the condition

of the soil, the dryness or otherwise of the weather, as well as the latitude and situation of the orchard. These and other considerations must all be taken into account by the operator. Generally speaking, as has before been stated, it is advisable to perform the operation at a time when the remaining terminal bud will not break out into new growth. From December to February apples and pears may be treated, according to climate and weather conditions. Apricots and peaches need summer pruning much earlier. Some operators have laid it down as a rule that any tree requiring summer pruning may be pruned just before the crop commences to ripen. This, again, may suit some seasons, but not others. To prevent the re-growth of the lateral, it has been recommended to merely fracture the portion to be removed later, and leave it hanging on the tree. This certainly will be effective; but it gives the orchard a very untidy appearance. It also leaves much more work for the pruner in the winter time, and this is one of the things that summer pruning is intended to obviate. A careful study of his varieties, locality, soil, and annual climatic conditions, will very soon give the operator such power over his trees that summer pruning will become a regular part of his orchard routine.

Fruit Prospects

The reports of fruit prospects have come to hand, and it is found that the crop in general will not be so heavy as was at first anticipated. There was a splendid show of blossoms, but it was hardly to be expected that the crop could amount to anything like last year's returns. Still, the returns promise to be far above the average of seasons, and thus prospects are very satisfactory.

VEGETABLE PESTS.

C. French, Junr., Assistant Government Entomologist.

So many specimens of insect and other pests of various kinds which attack vegetables are being forwarded for identification that it has been deemed advisable to compile a few notes on some of the more common of these pests. This season promises to be a very favourable one for the development and spreading of insects, and if steps are not soon taken, many of the vegetable crops will be adversely affected.

As many new mixtures for spraying have been placed on the market during the past year, several experiments have been conducted by the Entomological Branch in connexion with the extermination of pests. As some of the mixtures have proved successful, it is well to know at the beginning of the season what are the best materials to use.

Thrips.—Thrips are now about in countless numbers, and are causing the flowers on early tomato plants to turn brown, shrivel up, and fall. They also attack the flowers of beans, peas, &c.; in fact, almost every kind of flower, thereby causing considerable damage. This insect is a most difficult one to deal with on account of the habit it has of crawling into the centre of the flower; but such plants as tomatoes, peas, and beans can be more readily treated.

The following remedies have proved successful:—

Benzole emulsion.—This is a patent preparation, and can be purchased at any of the leading seed shops in Melbourne. One tin full (1 lb.), when diluted, makes 20 gallons of spray. The smell of the benzole remains on the plants for several days.

As a deterrent, spraying with coal tar water or a weak kerosene emulsion is recommended. A good hosing with cold water is also beneficial. The formula for coal tar water is as follows:—Boil one pound of coal tar in two gallons of water, and while hot add from 50 to 100 gallons of water.

RUTHERGLEN BUG.—This is another insect which, at the present time, is causing a lot of trouble to the vegetable grower. Tomatoes, beans, peas, potatoes, and other such vegetables are favourite foods of this pest. Benzole emulsion and coal tar water give good results if sprayed on the infested plants.

CUT WORMS.—Caterpillars belonging to the genera *Agrotis*, *Heliothis*, *Plusia*, are the chief members of this group. They are most destructive, and attack tomatoes, capsicums, beans, onions, cabbage, lettuce, &c. The caterpillars hide amongst the debris and soil during the day time, and at night come up to feed. Many gardeners cannot understand how it is that a whole plant laden with tomatoes can be destroyed in one evening, when they can see no trace of any insects. If the ground around the plants be turned up the grubs, usually curled up, will be discovered about an inch under the soil. The moths hide in the daytime under grass, wood, stones, bags, &c., and when darkness is setting in they fly about from plant to plant, depositing their eggs as they go.

The arsenate of lead spray has proved one of the best remedies yet discovered for these pests; but cabbage, lettuce, and other such vegetables should be washed before using. Poisoned baits are also used with success, the formula being as follows:—Bran, arsenic, and sugar mash: The best proportion to use is 1 part (by weight) of arsenic, 1 of sugar, and 6 of bran to which is added a sufficient quantity of water to make a wet mash. This preparation is usually made in wash tubs or half barrels. One of these is filled about three-fourths full of dry bran, and to this is added about 5 lbs. of arsenic, which is thoroughly stirred through the bran with a spade or shovel; 5 lbs. of sugar is next thrown into a pail, which is then filled with water, and the sugar is stirred until it dissolves. When the sugar water is added to the bran and arsenic, and the three well stirred, more water is added, and the stirring continued until every portion of the mash becomes thoroughly saturated. About a teaspoonful of this mixture is placed at the foot of each plant or shrub infested, dropping it in the shade when this can be done. Care must be taken that this bait is placed beyond the reach of children and domestic animals.

SNAILS AND SLUGS.—These pests appear to be more numerous this year than for many years past, and persons having vegetable gardens have had, and are still having, a fight to keep them under control. Ordinary remedies, such as soot, lime, carbolized sawdust, salt, &c., are, of course, of much assistance, but of themselves are not sufficient protection. In the arsenate of lead spray we have a mixture which will soon drive them out.

PUMPKIN BEETLE.—Last year this destructive insect caused much damage to melon, cucumber, and pumpkin plants and others of the same group. A few specimens have been noticed already this season, but they are usually very prevalent from December until February. A very common mistake is made by confusing this pest with the beneficial Ladybird, and several correspondents write asking for advice as to the destruction of the latter insect, under the impression that it is destroying their vegetables. The distinctive feature about the pumpkin beetle is that it is an elongated beetle, while the ladybird is almost round in shape. The following are preventives:—Coal tar water, Paris green, kerosene emulsion, and arsenate of lead. Inspector E. Wallis, of Wangaratta, states

that the crude oil of tar remedy has been tried with good results, the following being the formula:—Crude oil, ½ pint; soft soap, ½ lb.; caustic soda, 1 oz.; water, 5 gallons. Boil one pint of water, and in it dissolve the soap and soda: add oil of tar, agitate well, and add remainder of water; cool and use.

CABBAGE MOTH.—The larvæ of these moths are now making their appearance on the cabbage, cauliflower, turnip, and radish plants. In my opinion the best remedy to adopt is a spraying with arsenate of lead. Coal tar is also a good mixture to use against this pest, the proportion being the same as for thrips.

CABBAGE APHIS.—For this pest spray with nicotine as follows:—Steep 1 lb. tobacco in 1 gallon of hot water, and allow it to soak for 24 hours. Boil 1 lb. soap in 1 gallon of water until the soap is dissolved. Strain the tobacco water into the soap water. Stir well, and make up to 5 or 6 gallons. Use waste stems of the tobacco.

METALLIC TOMATO FLY.—This handsome fly, which is of a metallic colour, caused some damage to ripe tomatoes during last season. But my experience of this insect is that it only attacks over-ripe or damaged tomatoes, thereby hastening decay: a sound tomato is rarely attacked. When once the maggots are in the tomatoes it is an impossibility to reach them, and such tomatoes should be picked and burnt or placed in boiling water. Deterrents such as recommended for thrips are also beneficial.

BEAN BUTTERFLY.—Two years ago this serious pest, a small butterfly, caused severe losses to growers of beans in the Bairnsdale and other districts, no doubt on account of the dry weather experienced. The leguminous plants, on which the caterpillars feed, are absent during dry, hot weather, and the insects direct their attention to vegetables. Last year, owing to the fair amount of rain, the leguminous plants came up again, and consequently little damage was done to the bean crops. As this year is a favourable one for the growth of all plants, it is anticipated that this pest will not cause much damage. A good spray with benzole emulsion, arsenate of lead, or coal tar water will, however, be found of much use, if necessary.

TOMATO WEEVIL.—This new vegetable pest is still present in large numbers of gardens near the metropolis. A full account of the pest and remedies for its suppression will be found in my articles in the *Journal* for December, 1908, and October, 1909.

RED SPIDER.—The Red Spider is a pest well known to vegetable growers. It belongs to the group of Acarids or Mites, and is therefore strictly speaking not an insect. Its eggs, which are almost transparent, remain both in the soil and in the crevices of stakes, plants, and other objects during the winter. It is a tiny animal, just visible to the naked eye, and is almost transparent; in colour it varies from light reddish to quite red. Generally, it feeds on the underside of the leaves of various vegetable plants, particularly beans, melons of various kinds, making a kind of web underneath the leaves.

Vegetables should be well watered in the summer, as when once the ground is allowed to get dry the plants are attacked by the red spider.

Spraying with deterrents such as quassia chips or a weak kerosene emulsion is recommended. Coal tar water and benzole emulsion may also be used. A remedy that has proved of great use in England is paraffin jelly, the formula for which Professor F. V. Theobald gives as follows:—Paraffin, 5 gallons, soft soap, 8 lbs.; boil these together, and when

boiling add about 1 pint of water, and then well stir. This becomes a jelly when cold, and every 10 lbs. should be mixed with 40 gallons of water. The above amounts to about 160 gallons of wash.

It is not advisable to apply any spray wash within three days of the previous one. Care should also be taken that the nozzle of the spray pump is directed upwards so as to reach the underside of the leaves.

All stakes, after having been used for tomatoes, &c., should be treated with boiling water before being used again; by this means the eggs of the spider will be destroyed.

For the red spider eggs on apple trees, red oil has proved successful; and this is generally used in winter when the animals are dormant.

PRODUCTION AND MARKETING OF BEESWAX.

R. Beuhne, President, Victorian Apiarists' Association.

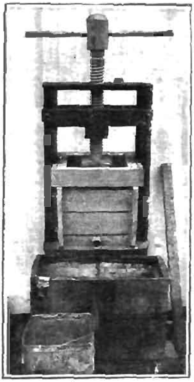
Beeswax, the secondary product of the apiary, is an article of commerce which is always in demand, with but little variation in prices for standard samples.

The production of wax by the honey bee is in a certain ratio to that of honey; thus, bees in trees or box hives yield, on the average, one pound of wax to twenty pounds of honey. With the introduction of the bar frame hive, and the method of extracting the honey from the combs and returning them to the hive to be refilled with honey by the bees, the ratio of wax to honey has been considerably altered and stands at 1 to 80. In other words, the production of extracted honey for the same weight of wax is four times that of the primitive method of cutting out the combs to obtain the honey. As a result, the price of honey has declined while that of wax has advanced during recent years. The wax is the product of a transformation of the honey or nectar when retained in the body of the bee for a time under certain conditions. Many attempts have been made to turn surplus honey into wax by feeding it back to the bees, but none have proved successful from a commercial point of view. While, therefore, the proportion of wax to honey cannot be profitably increased, so far as its production is concerned, there is room for much improvement in the methods of obtaining the wax from the combs, in the handling, refining and marketing.

Thousands of pounds of beeswax are annually thrown away, or burned with old black brood combs, because the old-fashioned method of boiling the combs in a bag submerged under water fails in obtaining more than a mere fraction of the wax contained in them. New comb consists entirely of wax and is white or yellow in colour, according to the flora from which the bees obtained the nectar converted into wax. When brood is reared in the cells the comb first becomes brown and, after a time, black, tough, and heavy. Each bee larva, before changing to the chrysalis stage, spins a cocoon, and as generation succeeds generation in the same cells old brood comb contains numbers of these in each cell, one inside the other; but, although the appearance of the comb is entirely changed, the original wax cells are still there. When old brood comb is dissolved by boiling in water each of the cocoons set loose by the melting of the comb becomes

coated with liquid wax which clings to the fibrous material of the cocoons, and but little will rise to the surface when boiled in a bag kept under water.

To obtain all the wax, or at least the maximum from old combs, pressure is required—something of the nature of a cheese press. The press shown in the illustration is a stout wooden box securely bolted together and lined with tin; inside of this is a slatted grating and bottom, leaving a chamber of 10 x 10 inches (12 inches deep) into which an ordinary sugar bag is inserted. The old comb is dissolved by boiling and poured into the bag, the latter is then folded down, the press block put on, and the screw gradually worked down. Water and wax escape by the outlet into a separating tank which retains the wax, but allows the surplus water to escape.



BEESWAX PRESS.

There are several types of wax presses, but one wood-slatted is preferable to a metal one, as then no heat need be applied to the press body itself to overcome the chilling of the wax in contact with metal. The amount of wax obtained from old black combs by means of a press, as compared with the old methods, is as 3 to 1, while the time occupied is but one-tenth, and the wax obtained is ready for market, if drawn off into suitable cooling vessels.

About 75 per cent. of the wax sold by commission agents in Melbourne is depreciated in value through having been wrongly treated at the apiary. Wax should never be overheated, and it is therefore best always to melt it on water. Wax boiled in rusty iron vessels has a dirty brown appearance; contact with galvanized iron or zinc turns it grey. Bright tin or tinned copper vessels are the only ones which do not affect the colour and character of the wax. Even the oldest comb will produce wax of a clear yellow or orange colour if properly treated.

The size and shape of the blocks of wax also leaves much to be desired. The moulds used by many producers are buckets, old milk dishes, kerosene tins, wash tubs, &c., into which the wax has been poured and left to set quickly in contact with the metal, instead of on hot water. The result is that the dirt, which will pass through even the finest strainer, is diffused all through the lower strata instead of being in a separate layer which can be scraped off. Quick cooling also results in unsightly cracks and clinging to the moulds. Wax is often sent to market in bags, and the fibre and dust adhering to it still further spoil its appearance. Blocks or cakes should not be larger than 20 lbs.; 10 or 12 lbs., however, is the best weight. There are many users of wax, such as saddlers, who do not require a large quantity, and who would buy direct at the agents if they could get wax in suitable shape. Even the wholesale buyer will rather pay a little more than re-melt, clean and re-mould. Better attention to the saving, proper handling, and marketing of beeswax would well repay bee-keepers and add a considerable amount to the total annual value of production.

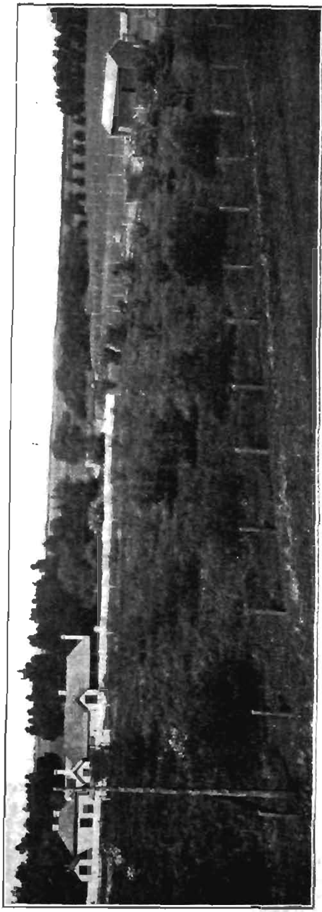
(To be continued.)

DEVELOPMENT OF AGRICULTURAL PRODUCTION IN VICTORIA.

T. Cherry, M.D., M.S., Director of Agriculture.

In the *Journal* for August I showed that there is a vast tract of Victoria, representing one-third of the entire State, with a rainfall of from 20 to 30 inches, in which agricultural progress has been extremely slow, and in which agricultural interests, in many respects, have been lying dormant. The greater part of this 18,000,000 acres is represented by a belt of country comprising the whole of the Western District, bounded by the sea coast from South Australian border to Warrnambool, thence along the Western Railway to Geelong, and then by the northern shores of Port Phillip Bay to Mordialloc. The northern boundary begins on the South Australian border about 25 miles south of Serviceton, thence runs almost due east to Stawell and north-easterly through Maryborough, Bendigo, Rushworth, Dookie to Yarrawonga. To the north-east of Melbourne the Sydney line of railway runs almost through the centre of the area in question. The explanation why agricultural interests are lying dormant in what ought to be the most productive portion of Victoria is a very simple one. Soil and climate are so extremely favourable to the land-owner that he is able to make a fairly comfortable living by grazing alone, and will not face the additional worry and expense of putting his land under cultivation. Along the North-eastern Railway, agricultural progress has been retarded to a very great extent by the profitable nature of the firewood industry. In a great number of cases land-owners make their living out of the firewood and the precarious returns from grazing, instead of setting to work resolutely in the direction of more cultivation, more fodder and more live stock. More than three-fourths of all the cultivated land in Victoria lies to the north of the area which we are now considering. It is in the drier parts of the Wimmera and the northern plains that cultivation is steadily progressive. Here again the explanation is that the soil and climate are not so favourable as in the central area we are considering, and that therefore the farmer is compelled to keep the plough going if he wishes to make substantial progress on his farm. In the whole 18,000,000 acres already described, the main areas under cultivation are approximately 100,000 acres each in the counties of Bourke, Ripon, Grant and Grenville. In the case of the county of Grant, much of the cultivation in the Ballarat district is not included in the 18,000,000 acres, because it has a heavier rainfall than 30 inches. In the same way, most of the cultivation in the Goulburn Valley is located in the drier portions of the counties of Rodney and Moira than those indicated by the boundary which I have described.

Now, I think it can be shown without any possibility of dispute that the grazing capacity and the number of stock carried on a farm in any part of Victoria, so long as cultivation does not form a prominent part of the system of management, are strictly limited and cannot be made to steadily increase from year to year. None of the grasses are sufficiently deep-rooted to withstand the effects of our normally dry summer; they do not wake up into sufficient activity until the rain comes in autumn. The main hope of increasing the stock-carrying capacity by grazing only is to grow lucerne on every farm where this can be done, and to replant the paddocks as fast as they are destroyed by a few years' grazing. This, however, involves cultivation, and, therefore, does not belong to the system of farming by grazing alone, which I am attacking. On the other hand, cultivation


GENERAL VIEW OF BAANGAL HOMESTEAD.

changes the aspect of affairs completely. Oats, rye, barley, peas and beans can all be grown on every acre of the 18,000,000 which we are considering, with absolute certainty year after year in succession. The experience of the last sixty years shows that a sufficient winter rainfall is assured, and, moreover, that these crops reach a sufficient stage of maturity to be harvested as fodder for live stock before the dry summer sets in. The weight of fodder, whether preserved green in the form of silage or dry in the form of hay, is at least three times as much as the land will produce from the best natural grasses. In many years it is ten times as much. Working the land allows the rain to penetrate more deeply into the sub-soil. The growth of deep-rooted leguminous crops constitutes the natural process for sub-soiling the land. At the same time this is, so far as we know, the method which nature has adopted from the beginning of the world to enrich the land with nitrogen collected from the atmosphere, at all events as far as regards 99 per cent. of the nitrogen which is present on the surface of the earth. Increased fodder means increased stock-carrying capacity. This means increased animal manures incorporated sooner or later with the soil. The use of the drill, which is becoming an essential part of every system of cultivation, allows the water soluble phosphoric acid to be placed in such close proximity to the seed that the little plant is able to get its earliest essential nourishment

as soon as ever it begins to grow. The advantages of increased cultivation therefore seem to me to be undeniable. The only question is—Will it pay?

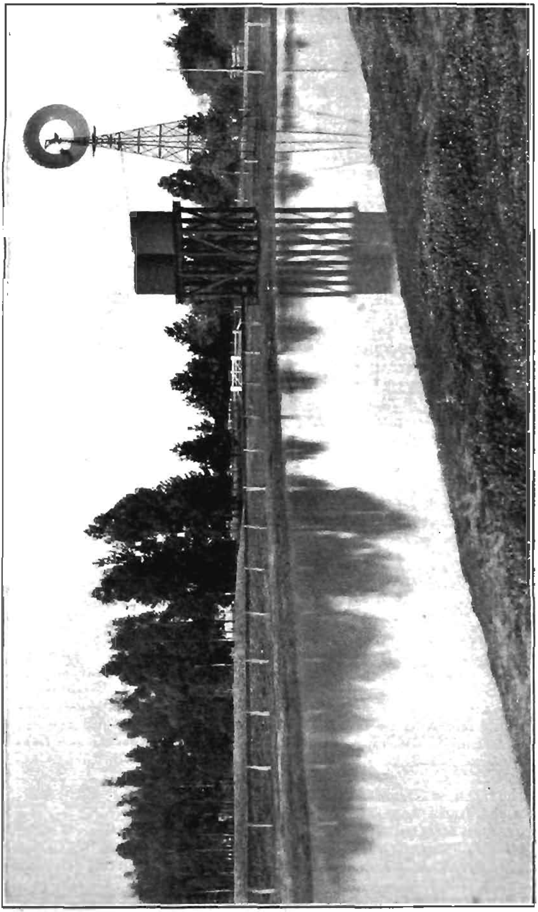
The two grain crops which have to be considered in regard to the area in question are wheat and barley. These two cereals must be placed on the market in the form of grain. As far as the Commonwealth is concerned, there appears to be every prospect of a payable market for barley for many years to come. The constant complaints which are heard from farmers about the unsatisfactory price which each individual receives for his malting barley when compared with the daily quotations in the papers is one reason why this crop is not looked upon with favour. In addition to this there is the social phase of the question—that the consumption of malted liquors in the Commonwealth in proportion to the population is, to say the least of it, not increasing. Malting barley therefore may be left out of the question in considering an area which runs into millions of acres, and we are thrown back on wheat. Here, however, I hold we are on solid ground. The prospects of the wheat market of the world are as good now as ever they were, probably better than they have been for the last generation; while the heaviest crops of wheat produced in any part of the world are produced in countries where the rainfall ranges from 25 to 30 inches. Practically all the wheat grown in Victoria up to the present is produced in areas where the rainfall is less than 20 inches. This question requires to be taken up in detail. The wheat yield of the world for the last six years is as under:—

WHEAT YIELD IN MILLIONS OF BUSHELS.

—	World.	Europe.	Victoria.	North America.	Australia.
1903	3,190	1,830	3	733	13
1904	3,152	1,747	29	637	76
1905	3,321	1,803	22	813	56
1906	3,435	1,826	24	875	71
1907	3,108	1,616	23	740	68
1908	..		[illegible]	776	45

Two things at once strike us from this table. The first is that the wheat yield of the world shows no substantial increase during the last six years; and the second is that the Victorian yield looks a little ridiculous when placed side by side with its big neighbours. While the wheat yield of the world is not expanding, the whole trend of the evidence goes to show that the demand for wheat is steadily increasing, and that nation after nation finds that wheaten bread is the "staff of life." As civilization advances, the demand for this cereal is certain rapidly to increase. The highest wheat yields in any country in the world are secured in the United Kingdom and in France, and these are the two wheat-growing countries which enjoy the heaviest rainfall. Of rust and smut, the two chief scourges of the wheat crop, the one is to a very large extent, and the other completely, under control.

The future of Victoria as far as wheat is concerned is therefore assured, but wheat cannot be grown by itself as a continuous crop. For a series of years it must form part of a definite rotation. Even under the most careful system of fallowing, in a few years the wheat becomes seriously handicapped by the quantity of wild oats that make their appearance in the crop. Naturally, therefore, oats are to be taken as the second crop of the rotation. In a dry district the oats should be succeeded by a year or two grazing, and



THE WATER SUPPLY.

this followed by a bare fallow before the wheat again begins the rotation series. In districts with a heavier rainfall the bare fallow is not necessary, and the oat crop may be succeeded with rape or other form of green fallow before the land is again put under wheat. In any case, however, it is certain that if our area under wheat is largely increased, the cultivation of oats must go on at the same rate. The question arises therefore "What can be done with the oat crop?" If exported as grain the price per bushel is certain to be low, but under existing circumstances there can be no doubt that it is much better to feed the crop to sheep or other farm animals. By this means it is easy to secure the equivalent of 1s. 8d. or more per bushel for the grain. The drain on the fertility of the land is reduced to a minimum, and the additional number of live stock carried enormously improves the value of the land from the point of view both of cultivation and grazing. A similar statement holds good with regard to the disposal of a crop of Cape barley. The average weight of either oats or barley required for a daily ration for a full grown sheep when mixed with a moderate amount of silage is ½ lb.

Along with this system of farming the use of the silo works in as the best *practical method necessary to complete the scheme.* The *practice* of feeding the silage to sheep has long gone past the experimental stage. In New South Wales, on one station near Wagga, from 15,000 to 20,000 sheep are regularly fed as the dry season comes round each year. Less than 2 lbs. of silage with ½ lb. of oats fed to the sheep in wooden troughs will not only provide an efficient means of carrying the flock safely through an ordinary drought, but in addition will render a reliable supply of early lambs for the export trade an absolute certainty.

That this system of farming can be carried out is a fact beyond dispute. The only question is "Will it pay?" In the July *Journal* I showed that, in the counties of Villiers (comprising the country round Warrnambool), Dalhousie (including Kyneton and Kilmore districts), and Delatite (the country between the North eastern railway line, the King River and the Great Dividing Range), matters were decidedly retrograde: that in these three counties, cultivation was on the down grade, and that, although the average yields and the minimum yields of wheat, oats, hay and potatoes in these counties were far higher than that of the rest of the State, production was stagnant or in a retrograde condition. Shortly after the publication of the above article an effort was made in Parliament to show that, although my figures were correct, still the falling off in production on the lines mentioned was more than counterbalanced by the increase in dairy farming and pigs. Unfortunately, things are no better in this direction than with regard to cultivation, as will appear from the following analysis:—

RETURNS FOR THE YEAR 1908 COMPARED WITH 1901.

	Percentage increase in Villiers, Dalhousie and Delatite.	Percentage increase for Victoria.
Horses ...	2.6	8.3
Dairy Cows ...	21.0	36.0
Other Cattle ...	5.0	15.0
Sheep ...	36.0	30.4
	Percentage Decrease in Swine	
Swine ...	41.0	39.8

It will therefore be seen that progress as measured by all kinds of live stock, with the exception of sheep, has been slower than in the rest of the State,

SOME OF THE TEAMS.

dairy cows in particular increasing only 21 per cent. as against an average of 36 for the whole State. The confirmation of the general trend of affairs in these counties is also seen by the decrease in the number of pigs during the above period. Had dairy farming been pushing ahead so that

END VIEW OF STABLES.

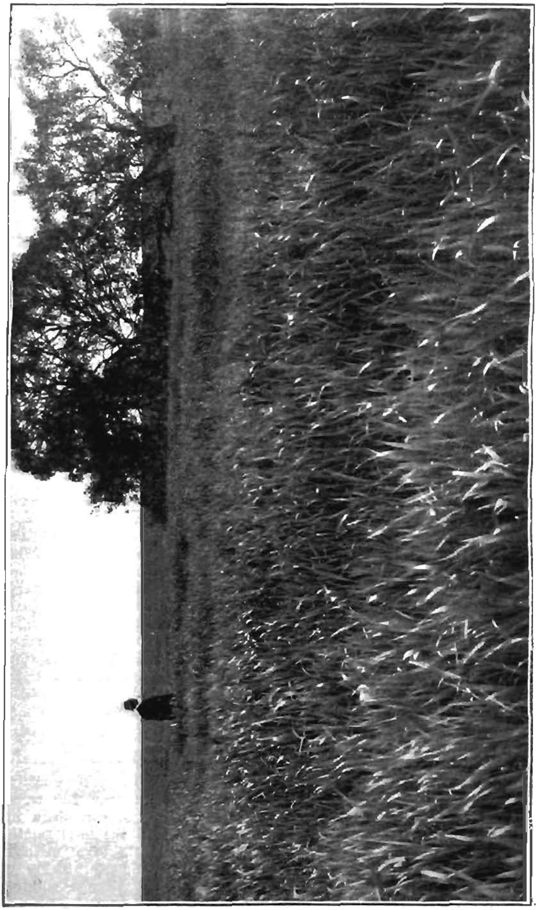
the increased returns were more than balancing the falling off in cultivation the number of swine would have increased. Instead of this, however, the trend has been precisely the same as in the rest of the State, the only difference being that the retrograde process has been a little faster. In

addition to the above figures regarding live stock, it must be remembered that, in the three counties in question, the number of acres under cultivation has fallen during the above period from 114,000 to less than 100,000, or including fallow from 121,000 to 111,000. On the other hand, the expansion of agriculture in the State as a whole is seen from the fact that during the same eight years the area has risen from 3,650,000 acres to 4,120,000 acres. As a matter of fact, there is no getting away from the position that in the three counties in question the decrease in wheat, oats and barley amounts to 35,000 acres, and the increase in potatoes and hay to slightly over 20,000 acres, leaving a net debit balance for the eight years of 14,250 acres. There is a slight improvement in the rate of increase in sheep, but not enough to affect the general conclusion.

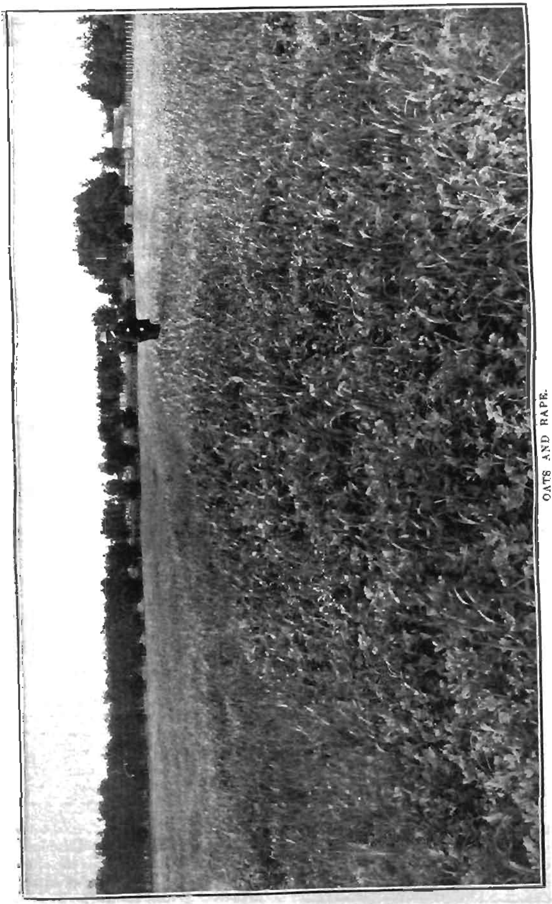
CONTRASTED WITH THE HIGHLY UNSATISFACTORY STATE OF AFFAIRS INDICATED IN THE ABOVE PARAGRAPH,

Let us turn to what has actually been done on a Western District property near Skipton, in the county of Ripon. This is the well-known Baangal Estate, belonging to Mrs. M. Gardiner and Sons. The area comprises 2,250 acres, and the remarkable fact has to be recorded that, at the present moment, only 50 acres out of the total area are under natural grass. About twenty-five years ago this property was bought from the late Honorable Francis Ormond, and was then looked upon as typical Western District sheep lands capable of carrying rather more than one sheep to the acre. It was carried on in this way for about twelve years until the death of Mr. Gardiner, when it became apparent that a change in methods was necessary in order to make a living off the property. Cultivation on a small scale was therefore commenced, and for the first few years it was handicapped by the fact that the trustees of the estate were not at all favourably inclined to view any innovation on well-established Western District methods. Gradually, however, the area under cultivation was increased until in the year 1901 a complete answer to all hostile criticism was furnished by the fact that the profits from 200 acres under cultivation were far and away greater than the profits off the remaining 2,000 acres. Since that time cultivation has been extending year by year. The returns from cultivation have supplied the capital necessary to transform this estate into the best example of a well-improved and completely equipped estate known to the writer in any part of Victoria. All the improvements have been paid for out of the profits made by cultivation. A careful survey of the photographs which have supplied the illustrations for this article will indicate the nature of the transformation. The net result has been that the value of Baangal has been increased probably five-fold during the last fifteen years, while the undeniable results obtained from this estate have had the effect of uplifting the cash value of every acre of land in the Western District of Victoria.

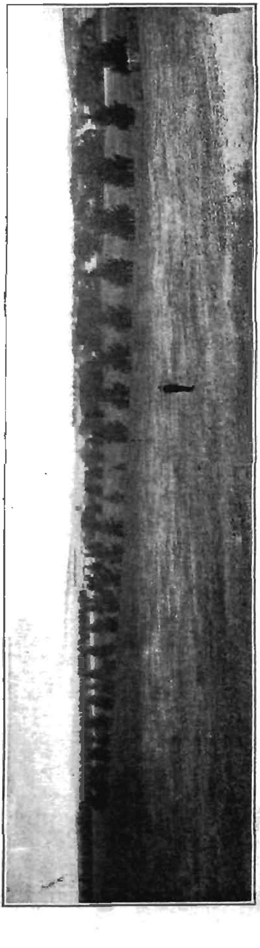
The first point that strikes the visitor on reaching the estate is the extent to which tree planting has been carried out. The whole estate is gradually being subdivided into paddocks, averaging not much more than 100 acres each, and each of these is surrounded by a plantation of trees a chain in width. The total area under plantations is 320 acres, and the total length of the plantations nearly 40 miles. The plan adopted is the usual method of ploughing and discing the strip into a fairly fine tilth and then sowing a mixture of Eucalyptus and other seeds early in the winter. The amount of



EARLY OATS.



OATS AND RAPE.



TIMBER BELTS ALONG SUBDIVISIONAL FENCES.

seed is about 4 ozs. per acre. Germination takes place in the course of a few weeks, and the first thinning is carried out the following autumn, and each successive year thinning is repeated. Experience has shown that the Sugar Gum is the tree which in practice gives the best results, but in addition to these there are long lines of *Pinus insignis* and other pines, some of them now reaching a height of from 30 to 40 feet. At first sight it seems a waste to allow so much of the land to be monopolized by plantations, but the experience on the treeless western plains will doubtless be verified in many other parts of Victoria. It is found that the amount of shelter for flocks and herds and the benefit to the growing crop which accrues from breaking the clear sweep of the winds both in summer and winter produce an effect which far more than compensates the loss of one acre in every seven. In addition to this the plantations themselves begin to be revenue producing from the time that they are four or five years old. The small saplings at that time are of use for firewood and other purposes, while in the course of two or three years more they become thick enough to furnish fencing posts and other props. By the time the saplings are about 8 inches in diameter, that is usually after they have been planted eight or ten years, they are readily saleable at a shilling a piece, and as the number per acre of saplings this size usually numbers from 600 to 1,000 trees, it will be seen that the thinning produces a steady source of revenue.

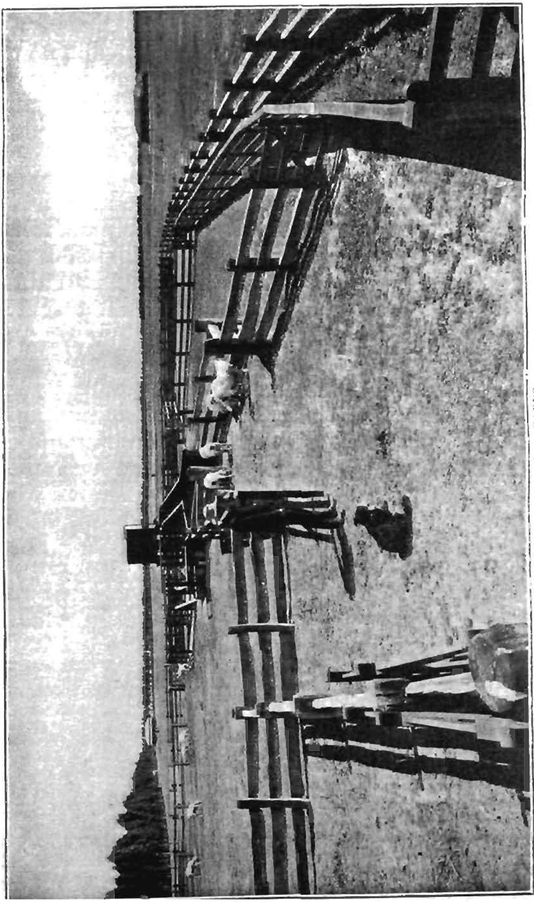
The cultivation methods adopted are almost exactly on the lines laid down in the former part of this article. Wheat forms the basis of

the export branch of the business, while oats, rape, lucerne and other fodder crops are regularly grown for the sheep and lambs. After a paddock has been under cultivation, every three or four years it is laid down in a mixture of rye grass, clovers and lucerne, and the grazing is thus made one part of the system of rotation in contra-distinction to the permanent dependence upon grazing, which is unavoidable where there is no cultivation. The illustrations show the ample provision made in this way both for green fodder crops, stacks and grain. Five years ago the Agricultural Reporter of the *Leader* thus described the operations taking place at Baangal :—

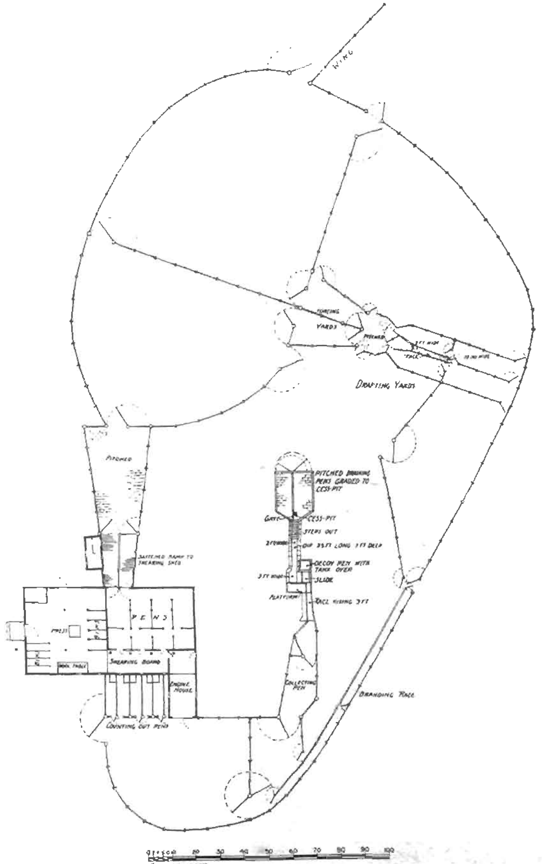
On the marked advantages of the rape fallow system, special note should be made of Mr. Gardiner's operations at Baangal. This marks the highest development up to date of the fallowing system as applied to grain growing in combination with sheep. The bare fallow system is good in itself as a conserver of the moisture in the soil, and as a cleaner of the land. The summer and spring tillage of the bare fallow kills the wild oats and other weeds, at the same time conserving the winter rains in the subsoil by what may be called an earth mulching of the surface. Outside of this, however, there is, in the bare fallow system exclusively, the loss of a year's production. The next step in advance was the bare fallow with sheep. Under that system the sheep co-operate most effectively with the summer and spring fallow tillage in the wheat cleaning, besides benefiting the land from a manuring point of view and, in addition, yielding a profit in themselves. Best of all, however, is utilizing the bare fallow in the production of a spring crop of rape for topping up crossbred lambs for the frozen meat export trade. In this way the marketable profits from the sheep and lambs are increased., First, as regards the fact that they can be turned off fat, instead of as stores ; second, in the large number that can be kept ; and third, in the increased fertilizing value of their action upon the land because of their greater number ; and, fourth, in the important manurial effect upon the soil of the rape itself.

On this latter point, Mr. Gardiner's experience is that even if he did not keep sheep at all he would always sow rape on the bare fallow for its fertilizing value alone. This, of course, is quite in accord with science, which teaches that the rape crop adds a large amount of humus to the soil when it decays, and thus greatly improves the water-holding capacity of the soil. That being so, it can be very easily apprehended how much greater the advantages are in also utilizing the rape for lamb fattening, when buyers for the freezing works are now regularly exploiting the country every spring for the purchase of three months' old 38 lbs. lambs at from 11s. to 16s. each, with delivery taken on the farm or station. Mr. Gardiner testifies to having fattened at the rate of 18 Shrop-Merino crossbred lambs per acre during the last three months of the past year. This is evidence that will bear thinking over both as regards the selling profits from the sheep and the fertilizing effects upon the land. Together with his 4 lb. of rape per acre, Mr. Gardiner also drills in 112 lb. per acre of superphosphate, which many may regard as an unnecessary heavy dressing. It has to be remembered, however, that this fallow is the land that early in the following year is to be sown with the wheat crop, and his experience is that it pays well, first in starting the rape into luxuriant growth with the earliest spring rains, and second in the after affects upon the cereal crops which follow. In addition to this, there is the fertilizing effect of the rape itself, together with the manurial value of so thick a grazing as 18 lambs per acre. Besides, there is no getting away from the actually demonstrated results. Mr Gardiner's land in its natural state is only up to a grazing average of one sheep to the acre, yet his wheat crops average six bags (24 bushels) and his oats 40 bushels to the acre, because they are all grain, so absolutely clean is the land.

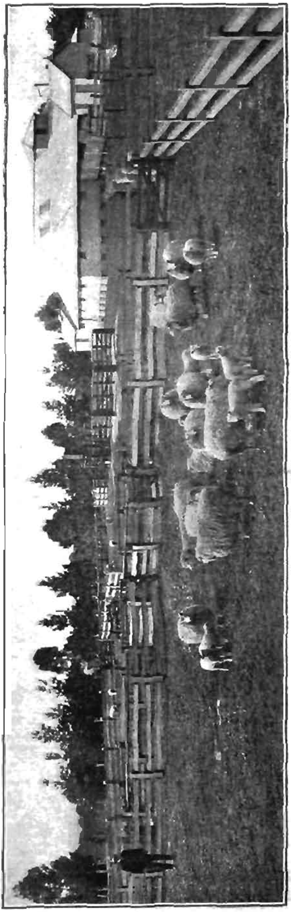
Since the above was written it is hardly necessary to say that operations have not been at a standstill at Baangal. On the other hand the success achieved up to that time has been developed and rendered year by year more certain. With the increased area under cultivation, the number of live stock has steadily increased, although just at the present time the sheep have for a few months almost disappeared from the property. Still this is a passing phase of the big development, and with the whole area under the cultivation and rotation system a fully accomplished fact next year, Mr. Gardiner expects to carry a much larger flock than ever the property has done before.



DRAFTING YARDS.



PLAN OF WOOL SHED AND DRAFTING YARDS.

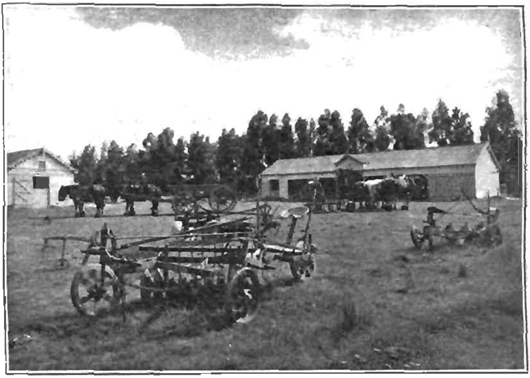


WOOL SHED AND DRAFTING YARDS.

Closely associated with the success in agriculture is the up-to-date character of every implement of tillage and every harvesting machine in all their details. The unique system is adopted of purchasing the first prize implements at a number of the leading agricultural shows each year. This insures that they are all above the average in workmanship and quality, and thoroughly up-to-date. After one or two years' service they are sold to be replaced by more prize winners, and it is found in practice that the price obtained for an implement after a single season's work is very frequently the same as what it cost originally. A very notable feature of the whole establishment is the substantial character and large size of the sheep-yards and shearing shed, which deserve more than a passing notice.

The sheep-yards, which are connected with the shearing shed, include drafting yards, sheep-dip, and branding race. A yard pitched with blue-stone leads to a battened ramp, connected with pens and shearing shed, and counting-out pens are connected with the shearing board on opposite side of the building. The walls of ramp and of counting-out pens are lined with vertical boarding. The counting-out pens open into a yard leading either to the branding race or sheep-dip. The collecting pen of dip leads to a battened race rising 3 feet. The dip is not at the end, but at the side, so that the sheep cannot see the bath from the race. The sheep come boldly out from the collecting pen to join the sheep in the decoy pen, at the other end of race.

Before they reach them, however, an opening in the race wall at the side of the dip allows the sheep to slide down to the bath on a floor set at a sufficiently steep angle to prevent the sheep from gaining a foothold. A swinging curtain hangs over this slide, and prevents the sheep from seeing the liquid in the bath, and, as the sheep slides, the curtain is pushed aside, and the sheep slips into the dip. The dip is 25 feet long, and 5 feet deep. Where the sheep enter, for 5 feet in length, the dip is 3 feet wide, but narrows, for the remainder of its length, to 2 feet. Steps lead up to the draining pens, which are pitched with bluestone, the floor being graded to a cesspit. The dip is constructed of solid masonry, 17 inches wide.



SHELTER BELT AND HOUSING.

The race of drafting yards, which is pitched with bluestone, diminishes in width from 2 feet to 15 inches. A vertical roller is fixed on each side of the race wall at the wide end to prevent the sheep from jamming, and a small gate is hung at the narrow end for closing the race. The race leads to two yards divided by a fence, with a gate at each end. The gate of the dividing fence at the end near race is hung so as to direct the sheep into either yard. This gate, and the small gate at end of race, can easily be operated by one man.

All the posts of the fencing are of redgum, the gate posts being 15 inches in diameter. The gates are of oregon. The hanging stiles are 4 in. x 3 in.; other stiles 3 in. x 3in.; mortised for rails. The large gates have a centre stile and two braces. There are four rails. In the small gates these are all 3 in. x 1 in. and in the large gates the top and bottom rails are 6 in. x 1 in. The braces are 4 in. x 1 in. double, one on each side of rail. The gates are all bolted together, hung with 2 in. x $\frac{1}{4}$ in. strap hinges on hooks bolted through posts. All the gates, of which there are 47 in the yards, are hanging in perfect order, and swinging clear of the ground. The gates are fastened with chains.

SEED TESTS.

(Second Series.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University, and Bertha Rees, Government Research Bursar.

In the October number of the *Journal* (p. 630) an account was given of a series of tests carried out with the seeds obtained from the Customs authorities. The results of a further more extended series of tests are given beneath, and these bear out the previous conclusion, that many of the samples of seed reaching Victoria from abroad do not come up to the proper standard either in purity or in germination power. Thus, out of sixty samples examined, no less than forty were below the standard generally accepted as representing a good sample, and even if we allowed for the fact that most of our imported seeds come from distant countries, by reducing the standard germination by 5 per cent., no less than twenty-six samples are still below the standard, and of these twelve are very seriously below it. Some of the samples of Kentucky Blue Grass and of Rye Grass were particularly poor, while Meadow Foxtail with 1 per cent. germination is useless, both to the seedsman and the farmer.

Similarly, in regard to weeds, cauliflower seeds with 64 per cent. germination and 12 per cent. of weeds possibly represent the screenings from the seed crop, and Crested Dog's Tail with 38 per cent. of weed seeds gives full scope for adding to the alien weed flora of Victoria.

The data as yet obtained are in sufficient to enable us to say much in regard to the influence of the origin of the seeds upon their germination power and capacity of standing transport. A few suggestive facts are, however, to be noticed. Thus, in the case of Fog Grass, three New Zealand samples averaged 85 per cent. germination, whereas three samples, probably of European origin, averaged 75 per cent., the average percentage of weed seeds being 10 and 7 respectively. It is surprising how much Fog Grass continues to be imported, although this grass is little better than a weed, and once introduced tends to overrun better pasture plants.

In the case of Rye Grass, the Tasmanian sample with 51 per cent. of weed seeds was one sent to Melbourne for cleaning. The samples from New Zealand averaged 79 per cent. germination, whereas those of uncertain origin gave 86 per cent. germination. One of the best of these was, however, possibly derived from New Zealand. In regard to weed seeds, the New Zealand samples averaged 8 per cent., the others 3 per cent., but on the other hand the purest and best sample of Rye Grass (0·4 weed seeds, 93 germination) was a New Zealand one, of which a large bulk was imported.

The samples of Lucerne were all pure and the American samples gave a better germination than the Hungarian and Hunter River samples. The latter contained, however, 16 per cent. of hard seeds, which explains the low percentage germination.

The Kentucky Blue Grass samples gave only low germination, the average being 35 per cent. instead of 75 per cent., and the best sample being the American one, with 52 per cent. Fanning and dressing the sample before placing it on the market by removing the lighter infertile seeds would have increased the germination power without seriously diminishing the total weight of the seeds. It is worthy of note that in several cases where the Customs authorities have insisted upon consignments of seeds being cleaned, the increased price obtained for the cleaned seed has not only paid for the cost of cleaning, but has also left a fair margin of profit. This is only right, for a good clean sample of seed is worth two or three times as much to a farmer as an impure one of low germinating power. In fact, a very foul sample of seed is not worth accepting as a gift, unless the farmer has the apparatus required to clean it, and not always even then.

The samples of White Clover from Germany afford a good instance of how seed from the same country varies in regard to purity and germination power. These samples would be bought and sold at much the same price, whereas sample 56, with 6·5 per cent. weed seeds and 54 per cent. germination, is not half the value of sample 55, with no weed seeds and 75 per cent. germination. The fact that all these German samples of White Clover were considerably below the standard is possibly the result of bad packing or bad storage on shipboard, or might be due to the seed being somewhat old.

Most of the seed received in Victoria from Europe is harvested from July to October. Assuming that harvesting, dressing, cleaning, marketing, and distributing take two months, and adding a further two to three months for the voyage to Victoria and the delivery and distribution on this side, the seed would reach the Victorian consumer at the earliest in the months from November to February, *i.e.*, either too late for the present season or from two to five months too early for the next. In other words, we can say that, whereas, on the whole, European-grown seeds planted in Europe will have an interval of one to six months between harvesting and replanting, European-grown seeds planted in Victoria will have usually an interval of six to twelve months between harvesting and replanting. Naturally, during the whole of this time, the seeds are deteriorating and diminishing in value, in some cases to a very marked extent. This forms a powerful argument in favour of Victoria growing its own supplies of seeds, or importing them, where possible, from New Zealand in preference to Europe. It is, in fact, worth the attention of the Commonwealth Government as to whether the production of locally-grown seeds is not an industry worthy of encouragement. Under present conditions it would be a very serious matter indeed if, in war time, all the present supplies of seeds from outside Australia were cut off, and there is no seed grown outside Australia which could not also be grown within it. Private enterprise, with a little encouragement, would probably achieve all that is necessary, for the production of good pure seeds is a very profitable business, provided that the growing, harvesting, cleaning, and marketing are all in the same hands. A few valuable new strains or varieties of both cultivated and garden plants have already originated in Australia, but this is a somewhat uncertain form of commercial speculation. It would be sufficient for the present if a steady ocal supply of known varieties, pure and true to type, were assured.

Name	Common Name	Source of Origin.	Percentage of Weed Seeds.	Percentage of Germination.	Proper Percentage of Germination.
1. Alopecurus pratensis	Meadow Foxtail	Holland ...	5	1	over 60
2. Brassica alba	White Mustard	Turkey ...	*Nil*	93	95
3. Brassica campestris, var. Napo-brassica	Swede, "Purple Top" ..	England ...	9	72	90–95
4. Brassica nigra	Black Mustard	Germany ...	*Nil*	76	85
5. Brassica oleracea	Cabbage, "Lamb's Earliest"	England ...	*Nil*	85	over 90
6. Brassica oleracea	Cauliflower, "Early London"	England ..	12	64	over 90
7. Brassica oleracea	Cabbage, "Flat Parisian" .	England ...	*Nil*	86	over 90
8. Brassica rapa	Rape, "Dwarf Essex" ...	United Kingd'm	*Nil*	92	90–95
9. Carum Carui	Caraway	Holland	*Nil*	67	food article
10. Chicorium Intybus ...	Chicory	Germany ...	*Nil*	49	over 80
11. Coffea arabica ..	Coffee	India ...	*Nil*	65	food article
12. Cucurbita pepo	Pumpkin	Germany ..	*Nil*	79	over 95
13. Cucurbita pepo	Pumpkin	? ..	*Nil*	71	over 95
14. Cynosurus cristatus	Crested Dog's-tail ..	New Zealand	38	84	over 70
15. Dactylis glomerata	Cocksfoot	New Zealand	*Nil*	51	over 80
16. Daucus carota	Carrot	New Zealand	*Nil*	92	over 70
17. Fagopyrum Sp.?	Buckwheat	Japan ..	0·7	88	over 85
18. Holcus lanatus	Fog Grass	New Zealand	3·8	84	over 80
19. Holcus lanatus	Fog Grass	New Zealand	4	87	over 80
20. Holcus lanatus	Fog Grass	New Zealand	14	83	over 80
21. Holcus lanatus	Fog Grass	?	4	72	over 80
22. Holcus lanatus	Fog Grass	?	13	75	over 80
23. Holcus lanatus	Fog Grass	?	12	78	over 80
24. Lepidium sativum	Cress, "Extra Curled" ...	England ...	*Nil*	92	over 95
25. Linum usitatissimum	Linseed	India ...	0·4	93	over 90
26. Linum usitatissimum	*Linseed*	*Calcutta* ..	2	94	over 90
27. Lolium perenne	Rye Grass	Tasmania ...	51	87	over 90
28. Lolium perenne	Rye Grass	? ...	1	81	over 90

29. *Lolium perenne*	Rye Grass	? ...	2	90	over 90
30. Lolium perenne	Rye Grass	? ...	0·8	87	over 90
31. Lolium perenne	Rye Grass	New Zealand	2·8	75	over 90
32. Lolium perenne	Rye Grass	New Zealand	25	59	over 90
33. Lolium perenne	Rye Grass	New Zealand	0·4	93	over 90
34. Medicago media	Sand Lucerne	America	4	72	over 95
35. Medicago sativa	Lucerne	Hungary ...	*Nil*	86	96–98
36. Medicago sativa	Lucerne ...	Hunter River	*Nil*	79	96–98
37. Medicago sativa	Lucerne	America ...	*Nil*	92	96–98
38. Medicago sativa	Lucerne	America ...	*Nil*	96	96–96
39. Panicum miliaceum	Red Millet	Germany ...	*Nil*	97	over 95
40. Panicum miliaceum	Red Millet	Turkey ...	2·5	95	over 95
41. Panicum miliaceum	Red Millet	Turkey ...	2	96	over 95
42. Panicum miliaceum	White Millet	Russia ...	*Nil*	90	over 95
43. Paspalum dilatatum	Golden Crown Grass ...	Queensland ..	1	62	over 75
44. Piper nigrum	Pepper	Java ...	*Nil*	*Nil*	food article
45. Pisum sativum	Peas	New Zealand	*Nil*	90	over 95
46. Poa pratensis	Kentucky Blue Grass ...	Eng. *viâ* N.Z.	0·5	44	over 75
47. Poa pratensis	Kentucky Blue Grass ...	?	2·5	23	over 75
48. Poa pratensis	Kentucky Blue Grass ...	England ...	3	22	over 75
49. Poa pratensis	Kentucky Blue Grass ...	America ...	1	52	over 75
50. Raphanus sativus	Radish "Chartier" ...	England ...	2	81	over 90
51. Raphanus sativus	Radish, "*Long Scarlet*" ...	England ...	*Nil*	81	over 90
52. Theobroma cacao	Cocoa	?	*Nil*	*Nil*	food article
53. Trifolium pratense	Red Clover	Germany ..	3	88	over 90
54. Trifolium minus	Suckling Clover	Holland ...	3	64	over 75
55. Trifolium repens	White Clover	Germany ...	*Nil*	75	95–98
56. Trifolium repens	White Clover	Germany ...	6·5	54	95–98
57. Trifoleum repens	White Clover	Germany ...	1·2	67	95–98
58. Triticum vulgare	Wheat, "Frampton" ...	Vancouver ...	*Nil*	87	98
59. Zea mais	Pop Corn	America ...	*Nil*	96	over 90
60. Zea mais	Pop Corn	America ...	*Nil*	86	over 90

1. *Alopecurus pratensis* (Meadow Foxtail).—Germination very low. Contained 4 per cent. of Dock and 1 per cent. of other weeds.

2. *Brassica alba* (White Mustard).—A very fair sample, but seeds varied in diameter from 1·5—3 m.m.

3. *Brassica campestris*, var. *Napo-brassica* (Swede).—A bad sample of seed, unevenly ripened and many withered. It contained as impurities a large number of seeds of Dock, also Campion, &c. In all probability a sample of rejected seed.

4. *Brassica nigra* (Black Mustard).—Poor seed, irregular in size, many withered and broken. Sample contained a quantity of foreign impurities, but no weed seeds present.

5. *Brassica oleracea*. L. (Cabbage, "Lamb's Earliest").—Sample contained no weed seeds, but was otherwise poor. Many seeds were withered or broken and they varied much in size.

6. *Brassica oleracea*. L. (Cauliflower).—The weed seeds present were chiefly Dock and included also a species of composite.

7. *Brassica oleracea*. L. (Cabbage "Flat Parisian").—Seeds varied in size from 1—2 m.m. and many were broken or withered.

8. *Brassica rapa*. L. (Rape).—Very fair sample. 1·5 per cent. were broken, but no weed seeds present.

9. *Carum Carui* (Caraway).—Imported from Holland for culinary purposes, but as it has proved germinable, it is classed among seeds.

10. *Chicorium Intybus*. (Chicory).—Percentage of germination very low. Sample contained no weed seeds, but about 6 per cent. of foreign impurities.

11. *Coffea arabica* (Coffee). Freshly imported unroasted seeds.

12. *Cucurbita Pepo* (Pumpkin).—By sailing ship from Germany; sample contained no impurities.

13. *Cucurbita Pepo* (Pumpkin)—Ex ship *Loch Carron* (for bird seed).

14. *Cynosurus cristatus*. L. (Crested Dog's-tail).—Sample sent from New Zealand for treatment. The large percentage of weed seeds present included Spergula, Dock, Suckling Clover, Fog Grass, Darnel, &c. In addition, the seed was very slow in germinating and hence of little value.

15. *Dactylis glomerata*. L. (Cock's-foot Grass).—Sample free from weed seeds and contained little foreign matter of any kind. But seed very slow in germinating and percentage of germination very low.

16. *Daucus Carota*. L. (Carrot).—Sample contained some foreign impurities, but no weed seeds. Germination excellent.

17. *Fagopyrum* (Buckwheat).—Good sample of seed, small amount of Rice present as an impurity.

18. *Holcus lanatus*. L. (Fog Grass).—A mixed sample of Fog and Clover. There were a large number of weed seeds present, including Plantain, Dove's-foot, Cranesbill, Darnel, Dock, Ranunculus, Sorrel and Ergot, the last four are all on the list of seeds prohibited entry by the Customs.

19. *Holcus lanatus*. L. (Fog Grass).—A mixed sample of Fog and Clover. The weed seeds included Linseed, Darnel, a species of composite, Wild Caraway, Dock, Ranunculus and Sorrel.

20. *Holcus lanatus*, L. (Fog Grass).—Sample of seed rejected from New Zealand. Weeds present included Dock, Rye Grass, Cocksfoot, Wild Caraway, White Clover, Suckling Clover, and Ergot.

21. *Holcus lanatus*, L. (Fog Grass).—Weeds seeds included Wild Caraway, Clover, Italian Rye Grass and Ergot.

22. *Holcus lanatus*, L. (Fog Grass).—*Ex* s.s. *Warrimoo*: sample contained a large number of weed seeds, among which were Rye Grass, Clover, Campion, Plantain, Wild Caraway and Ergot.

23. *Holcus lanatus*, L. (Fog Grass).—*Ex* s.s. *Warrimoo*. Rather fewer weed seeds than in previous sample, and included Crepis fœtida (a composite), Campion, Wild Caraway, Clover and Ranunculus.

24. *Lepidium sativum*, L. (Cress).—Good sample of seed, free from impurities.

25. *Linum usitatissimum*, L. (Linseed).—*Ex* s.s. *Sangolia*: a good sample with few impurities, and having a satisfactory percentage of germination.

26. *Linum usitatissimum*, L. (Linseed).—The weed seeds included Charlock, Lentil, Wheat, &c.: also about 2·5 per cent were broken or otherwise damaged.

27. *Lolium perenne*, L. (Rye Grass).—This sample, which was imported from Tasmania, was quite the worst examined. It was said that "with a little screening, it would be very good." The weed seeds were Dock and Plantain, chiefly the former.

28. *Lolium perenne*, L. (Rye Grass).—*Ex* s.s. *Warrimoo*: weed seeds included both Dock and Darnel.

29. *Lolium perenne*, L. (Rye Grass).—*Ex* s.s. *Warrimoo*: contained chiefly Italian Rye Grass as an impurity. One of the two samples of Rye Grass tested gave a proper germination result.

30. *Lolium perenne*, L. (Rye Grass).—*Ex* s.s. *Warrimoo* This sample contained a smaller percentage of weed seeds than previous specimens, but included Crepis fœtida, in addition to Italian Rye. It was machine dressed.

31. *Lolium perenne*, L. (Rye Grass).—Italian Rye Grass was the chief impurity.

32. *Lolium perenne*, L. (Rye Grass).—Of the weed seeds present, 24 per cent. were Italian Rye, and the remaining 1 per cent. included Crepis fœtida, Dock and Plantain.

33. *Lolium perenne*, L. (Rye Grass).—A good sample of seed, containing few impurities.

34. *Medicago media*, Pers. (Sand Lucerne).—Chief weed seed present was Plantain. About 5 per cent. of the seeds were hard, and so would not germinate without treatment.

35. *Medicago sativa*, Morison (Lucerne).—Sample contained no weed seeds. About 1 per cent. of seeds were damaged, and 3 per cent. were hard.

36. *Medicago sativa*, Morison (Lucerne).—No weed seeds present; 10 per cent. were hard, which accounts for lower percentage of germination.

37. *Medicago sativa*, Morison (Lucerne).—No weed seeds, and gave good percentage of germination.

38. *Medicago sativa*, Morison (Lucerne).—Percentage of germination excellent: 3 per cent. hard, so only 1 per cent. non-germinable.

39. *Panicum miliaceum*, L. (Red Millet).—Excellent sample.

40. *Panicum miliaceum*, L. (Red Millet).—Dock was principal impurity. Sample otherwise good.

41. *Panicum miliaceum*, L. (Red Millet).—*Ex Loch Carron*: imported for bird seed and gave excellent germination result.

42. *Panicum miliaceum*, L. (White Millet).—Very good sample.

43. *Paspalum dilatatum*, Poir (Golden Crown Grass).—Only weed seed present was Crepis fœtida (Fetid Hawk's Beard).

44. *Piper nigrum* (Pepper).—Imported as spice. The method of preparation of pepper is such as to destroy all power of germination.

45. *Pisum sativum*, L. (Peas).—Fair sample of seed, but the average germination not high enough.

46. *Poa pratensis*, L. (Kentucky Blue Grass).—Sample contained some foreign impurities and a small percentage of clover.

47. *Poa pratensis*, L. (Kentucky Blue Grass).—Among the weed seeds present in this sample were Dock and Shepherd's Purse (*Capsella Bursa-pastoris*), both of which are proclaimed weeds.

48. *Poa pratensis*, L. (Kentucky Blue Grass) *Ex* s.s. *Moana*. The weed seed included Lolium, Plantain, Clover, &c.

49. *Poa pratensis*, L. (Kentucky Blue Grass),—*Ex* s.s. *Moeraki*. The principal weed seeds present were Clover, Campion, and Dock.

50. *Raphanus sativus*, L. (Radish).—The seeds varied in size from two to three mm. Dock was the only weed seed present, and, in addition, about 2.5 per cent. were broken.

51. *Raphanus sativus*, L. (Radish).—A fair sample containing no weed seeds.

52. *Theobroma cacao* (Cocoa).—A number of these seeds were damaged, but it was impossible to estimate the percentage as they were sent under separate cover.

53. *Trifolium pratense*, L. (Red Clover).—11 per cent. were hard. The weed seeds included Plantain, Chenopodium, and a small amount of White Clover.

54. *Trifolium minus* (Suckling Clover).—16 per cent. were hard. The 3 per cent. of weed seeds present was chiefly Dock. The sample contained, in addition, about 6 per cent. of White Clover.

55. *Trifolium repens*, L. (White Clover).—This sample contained about 2 per cent. of hard seeds. This is considerably below the usual average, which is 13 per cent.

56. *Trifolium repens*, L. (White Clover).—7 per cent. were hard. The weed seeds included Plantain and Dock, also Dodder (0.16 per cent.).

57. *Trifolium repens*, L. (White Clover).—*Ex* s.s. *Scharnhorst*. Dock, Campion, and a species of Composite were the chief impurities, also Dodder (0.05 per cent.).

58. *Triticum vulgare*, L. (Wheat).—The sample contained no weed seeds, but 5 per cent were damaged.

59. *Zea mais*, L. (Pop Corn).—No weed seeds present, but 2 per cent. of the grains were pierced by borers.

60. *Zea mais*, L. (Pop Corn).—The percentage germination was low, but the sample was imported for confectionery purposes.

All samples of Lucerne tested were free from Dodder, which occurred only in small quantities in two samples of Clover Nos (56 and 57).

Ergot found in four out of six samples of Fog Grass (Nos. 17, 20, 21, 22.)

Dock seems the commonest weed seed, out of thirty-three samples containing weed seeds Dock was present in seventeen.

BUILDING HINTS FOR SETTLERS.

IV.—PLAN, SPECIFICATIONS, AND QUANTITIES OF A WOOD AND IRON HAY SHED.

A. S. Kenyon, C.E., Engineer for Agriculture.

SPECIFICATIONS.

Excavator.—Excavate the ground for stumps to a depth of 2 ft. 2 in. and well ram the earth put back round stumps. In ramming, only a small portion of the earth is to be put back at a time and then rammed before any more earth is put back, using a little water when ramming.

Timber.—Timber is to be sound and free from all defects. All timber is hardwood except for sole plates and stumps, which are to be redgum or jarrah.

Stumps, Sole Plates, and Sleeper.—The stumps, 6 inches x 4 inches x 4 feet, are to be spaced 5 feet centre to centre each way (the 6-inch face going across building) and to stand on 8-in. x 2-in. x 10-in sole plates. The stumps to be set perfectly upright. Halve the 4-in. face for a length of 9 inches from top of stump and bolt stump to 5-in. x 3-in. sleeper with one 6½-in. x ½-in. bolt to each stump, the sleeper to rest on its edge on the shoulder of the stump formed by the halving. The sleepers to be halved at joints. The joints in one row of sleepers must not be in line with the joints in the next row.

Joists.—Joists 4 inches x 2 inches, spaced 20 inches centre to centre, to rest on the sleepers, every third joist coming against a stump and a stud to which it is to be bolted with one 6½-in. x ½-in. bolt to each stump and 4-in. x 4-in. stud and a 4½-in. x ½-in. bolt to the 4-in. x 2-in. studs. The intermediate joists to be well skew nailed with 3-in. nails to the sleepers.

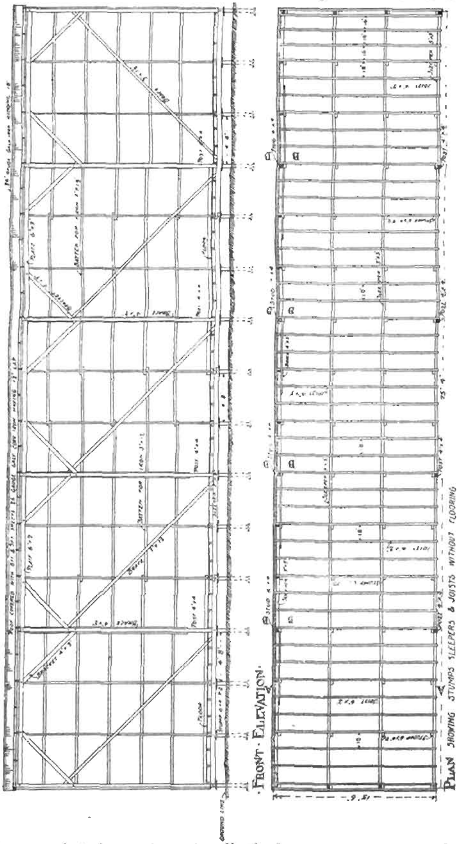
Floor.—The floor of 6-in. x 1-in. hardwood to be nailed to the top of joists with two 2½-in. nails to each joist, the nails being well driven home. The cross joints of floor are not to be in a line.

Studs.—The studs to be spaced to come over the top of stumps, the corner and every third stud to be 4 inches x 4 inches, and the intermediate studs 4 inches x 2 inches. The studs in back wall are bolted to joists as before described. The 4-in. x 2-in. studs in end walls to be bolted to stumps with 5½-in. x ½-in. bolts.

Posts.—The four 4-in. x 4-in. posts in front are to be spaced to come opposite the 4-in. x 4-in. studs in back wall, to be bolted to joists with 6½-in. x ½-in. bolts, braced to 4-in. x 4-in. studs with two 4-in. x 2-in. braces, which are to be bolted to studs and posts and at intersections (which are to be made solid with 4-in. x 4-in. packing pieces) with 8½-in. x ½-in. bolts. The inside of posts to be checked 1 inch deep by 6 inches for 6-in. x 2-in. plate, the top of check being 5 inches below the top of post.

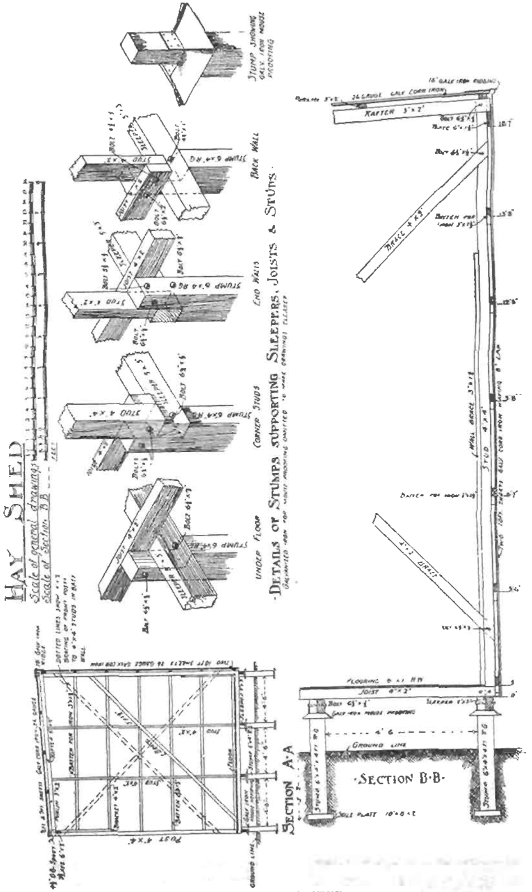
Top Plates.—The 6-in. x 2-in. front top plate is to be halved at the joints which are to come on and be bolted to posts with two 5½-in. x ½-in. bolts to each post. The plate is to be supported with 4-in. x 2-in. brackets as shown bolted to inside of posts with 6½-in. x ½-in. bolts and halved and bolted to inside of plate with 3½-in. x ½-in. bolts. The 6-in. x 1½-in. back plate is to be bolted to studs with 6-in. x ½-in. bolts, halved at joints on to 4-in. x 4-in. studs, using two bolts.

Bracing.—The studs are to be braced with 3-in. x 1½-in. battens; on back wall the brace is to be well nailed with 3-in. nails on to the inside



PLAN AND ELEVATION OF WOOD AND IRON HAY SHED.

f sleeper and studs, on the end walls the brace is to be checked ½ inch on the outside of joist and let 1 inch into inside of studs.



DETAILS OF HAY SHED.

Battens for Iron.—The battens for iron are to be 3 inches x 1½ inches well skew nailed with 3-in. nails to outside of studs. The battens on back wall are to be spaced as figured on section B.B., the bottom of one batten being in a line with the top of the next batten on the same row. The joints in one row of battens are not to be in a line with the joints in the next row. The dimensions figured on section B.B. are the centre of the battens on the end walls.

Rafters.—Rafters, 5 inches x 2 inches, spaced 30 inches centre to centre to rest on top plates, every second rafter coming against a stud to which it is bolted, with 6½-in. x ½-in. bolts to 4-in. x 4-in. studs and 4½-in. x ½-in. bolts to 4-in. x 2-in. studs. The intermediate rafters and ends of rafters on front plate, which do not come against posts, to be well skew nailed to plates. The two end rafters to be on outside of studs, which are to be checked ½ inch for same, to which they are bolted with 6½-in. x ½-in. bolts.

Purlins.—Purlins, 3 inches x 2 inches, to be well nailed with 4-in. nails to top of rafters. The joints of one row of purlins are not to be in a line with the joints in the next row.

Corrugated Iron.—Cover the roof with 8-ft. and 9-ft. sheets of 26 gauge corrugated galvanized iron, having a lap of 12 inches vertically and 1½ corrugations horizontally. Cover the back and end walls with two 10-ft. sheets of similar iron having a lap of 8 inches vertically and 1½ corrugations horizontally. Nail with 2-in. galvanized spring-head nails at every second corrugation to purlins and 3-in. x 1½-in. battens. Roof iron to project 3 inches beyond end walls and to be finished in a roll.

Spouting and Down Pipe.—Fix with slight fall 4½-in. O.G. spouting 24 gauge galvanized iron, to eaves purlin with galvanized iron straps every 2 ft. 6 in., the straps being long enough to nail to the top and down back of purlin with 1¼-in. galvanized clouts. Spouting to be double soldered and riveted at joints. Connect spouting with 3-in. diameter down pipe to convey water to tank.

Ridging.—Cover the angle of roof and back wall with 18-inch 26 gauge galvanized iron ridging nailed with galvanized spring-head nails to purlins on top and to ends of rafters on back wall.

Mouse-proofing.—To make floor mouse-proof a piece of 14-in. x 12-in. galvanized iron is to be fixed to each stump as shown in drawing, secured to shoulder and side of stump with 1¼-in. galvanized clouts. No steps should be fixed to building.

QUANTITIES.

Red Gum—
8-in. x 2-in. : 64 10-in. sole plates.
6-in. x 4-in. ; 64 4-ft. stumps.

Hardwood—
6 in. x 2-in. : 5 15-ft. 6-in., front top plate.
6-in. x 1½-in. : 5 15-ft. 6-in., back top plate.
6-in. x 1-in. : 2,500-ft. run, flooring.
5-in. x 3-in. : 12 20-ft. 6-in., 4 15-ft. 6-in., sleepers.
5 in. x 2 in. : 16 16-ft. rafters.
4-in. x 4-in. ; 6 19-ft. 6 in. 6 18-ft. 6-in., studs and posts.
4-in. x 2-in. ; 8 22-ft., 14 19-ft. 6-in., 46 16-ft., braces, studs, joists.
4-in. x 2-in. ; 6 8-ft. 6in., 4 7-ft. brackets
3-in. x 2 in. ; 15 20-ft. 6 in., 5 15 ft. 6-in. purlins.
3-in. x 1½-in. ; 18 20-ft. 6-in., 18 15-ft. 6-in., 7 21-ft., battens for iron, wall bracing.

Galvanized Iron—
Corrugated, 26-gauge; 114 10-ft., 41 9-ft., 41 8-ft.
Plain 26-gauge ; 5 72-in. x 36-in., for mouse proofing.
Ridging, 26-gauge ; 14 lengths, 18-in.
Down pipe, 26-gauge ; 4 lengths, 3-in. diameter.

Spouting, 24-gauge; 14 lengths, 4½-in., O.G.
Straps, 31, with 6-in. tail.
Spring-head nails, 2,500.
Clouts, 4 lb. 1¼-in.
Wire nails, 36 lb. 2½ in., 14 lb. 3-in., 7 lb. 4 in.

Bolts, Nuts, and Washers—

20 8½-in. x ½-in.; fixing 4-in. x 2-in. braces to 4-in. x 4-in. studs and posts, and at intersection of bracing.
166 6½-in. x ½-in.; fixing sleepers to stumps, joists to stumps and 4-in. x 4-in. studs, brackets to posts, rafters to 4-in. x 2-in., studs in end wall, and to 4-in. x 4-in., studs and posts.
20 6-in. x ½-in.; fixing back top plate to studs.
14 5½-in. x ½-in.; fixing 4-in. x 2-in. studs to stumps and front top plate to posts.
20 4½-in. x ½-in.; fixing 4-in. x 2-in., studs to rafters and joists.
10 3½-in. x ½-in.; fixing brackets to front top plate.

The cost of this material in Melbourne would be about £60.

VI.—STRIPPING SHEETS OF BARK.

T. M. Whelan, Overseer, Rosedale Experimental Farm.

In Victoria vast tracts of country still remain in their primitive state. As efforts are now being made to utilize in a practical manner and render fit for permanent settlement areas of so-called barren waste lands, hitherto popularly deemed unfit for the purpose, it may prove of interest, if not of practical value also, to briefly describe some of the initial operations of a settler in forest lands in Victoria. The settlers first desire being a habitation such as may be conveniently erected with a minimum outlay of both labour and capital, I will first describe the practical methods in vogue of stripping bark for building purposes.

Several species of eucalypts are suitable for the purpose, such as red gum, grey box, yellow box, messmate and stringy bark. The latter tree is, however, the one which is most frequently used; it is more plentiful and the bark proves the most durable in actual use. A well constructed building, with stringy bark walls and roof, will prove serviceable for a period of twelve to fifteen years, and in exceptional cases even longer, while the life of the bark of the other varieties of trees named above may be placed at three to five years.

The operation of bark-stripping is usually performed by two men, though it may be easily done by one. It is essential to choose trees with a straight bole free from limbs, knots, or other excrescences, otherwise a difficulty in getting the sheets of bark to properly flatten out will arise. The tree is first girdled at a sufficient height from the ground to clear the spurs or buttresses usually found at the base of all forest trees, and again girdled at the height necessary to give a sheet of bark of the length required, which is usually from 6 feet to 10 feet. For making the top girdle or incision a ladder of the requisite length is most favoured, the operator standing on the rung of the ladder and using a tomahawk or half axe. An adze with a specially made handle, 6 feet to 8 feet long, may be used instead, the operator standing on the ground. Another method is to use a rope or strap passed round the tree and of sufficient length to also pass round the operator's body while standing about 2 feet from the tree. In actual practice the latter method will be found the easiest and most expeditious, but it calls for both nerve and muscle to acquire the art of swinging easily in the band. The operator makes a small incision in the bark on which to rest the ball of the foot and take the weight of the body, while moving the strap higher and higher up

the tree. By this method two, three, or more sheets of bark may be removed from the one tree, taking the topmost sheet off first and working downwards.

Having girdled the tree, the next operation is to make a perpendicular incision the full length of the sheet of bark, which is then gently prised off with a light pole of sufficient length and pliable enough to curve freely round the bole of the tree. Care must be exercised in prising off the bark, otherwise the sheet of bark will split on the inner side, and then becomes useless for roofing purposes. When the sheet of bark has been successfully removed from the tree the next operation is to take off the rough outer portion. This is termed "dressing" the bark. The best implement for this purpose is a sharp spade, as it leaves a smooth even outer surface. Some judgment is called for in dressing so as not to remove too much of the outer bark; though an over-dressed sheet of bark may present a more pleasing appearance, it will prove much less durable.

CUTTING.

PRISING OFF.

The next operation will depend on varying circumstances, of which the weather is the most important. Should the work be carried on in the winter season, when there is an absence of hot sun and drying winds, the sheet of bark may be placed, outer side downwards, on the ground; a small stick is placed so as to hold the sheet about half open until it toughens and becomes pliable, usually in about two days. The sheet is then turned, inside downwards, and gently flattened out and left thus for a few days longer when the bark may be carted in ready for stacking. When the work of stripping is carried out in late spring or early summer, another method is employed, as

with the advent of hot sun and drying winds the sheet of bark would quickly set and become rigid as a board and could not afterwards be flattened out. In dry hot weather, therefore, after dressing, lean the sheet of bark against the tree and underneath make a fire with the bark removed in dressing. In a few minutes the sap in the bark will become heated and this will render the sheet both tough and pliable, when it may be at once carefully flattened out on the ground and a small log placed on top to keep it flat; in two days it will be fit for carting and stacking.

When the bark is ready for stacking, a few spars are placed on the ground, and the sheets of bark laid side by side on these, the next layer of sheets being piled crosswise to the first layer and so on. It is not advisable to place too many sheets in one stack, and the stacks should be reversed, that is, top sheets placed on bottom and bottom sheets on top after the lapse of a few days. It may be necessary to alter the stacks twice; if left

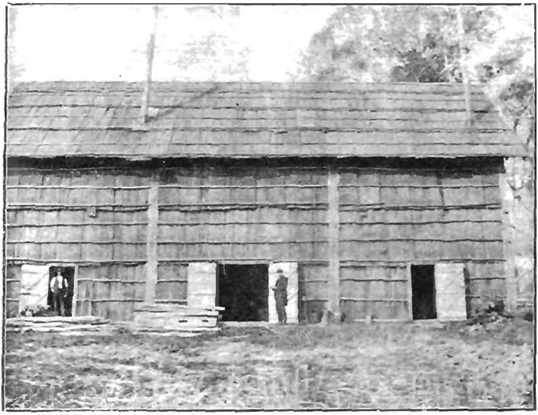
DRESSING.

SOFTENING BY FIRE.

as originally stacked the pressure on the bottom sheets is too great, and they may split while shrinking. The shrinkage in width of sheets of bark is considerable, being about 2 inches to the foot, thus, a sheet of bark measuring, while green, 3 ft. 6 in., will shrink to about 3 feet in width. When required for use, the ends of the sheets of bark are trimmed square, and the sides may also require trimming to an equal width at both ends, as the bark is always wider, when stripped, at the end nearest the base of the tree. It may be remarked, in passing, that the usual mode of taking only a single sheet of bark from a standing tree is a wasteful one. It would be preferable to

fell the tree in such a manner that the head of the tree will rest across a log lying on the ground. The whole of the available bark on each tree is then secured, and the bole of the tree may be split into posts and rails for fencing, and also into shingles, palings and other timber requisite for further operations on the farm.

Though bark may be stripped nearly all the year round in some seasons, the best time for the operation will be found to be from June until September. In those months the bark strips cleanly and freely, while later in the year difficulties will be encountered. When utilizing the bark for building purposes various methods are adopted. One of the best is to give each sheet a lap 9 inches over the previous one, taking care to nail only one side of each sheet. If nailed on both sides, the sheets will split while shrinking



TOBACCO BARN BUILT OF BUSH TIMBER AND STRINGY BARK.

and leave a gaping aperture in the roof. It is usual to nail the under side of each sheet to the purlin, the next sheet overlapping the nail heads preventing any leakage during a rainfall. Many roofs are constructed without using nails, the mode in that case being to bore a ½ inch hole a few inches from the top end of the sheet; a piece of green hide is then passed through the hole and lashed to the purlin or ridge pole. Riders made from small saplings about 4 inches in diameter are placed on the roof, and may be fastened in various ways, one of the simplest being with ordinary fencing wire passing over the ridge. An extra piece of bark is placed beneath the wire to prevent the wire chafing through the ridging bark.

For many purposes on a farm, bark roofs will be found to be preferable to roofs constructed of iron, as in summer the bark maintains a lower and more equable temperature within the building. The cost of a bark roof is about one-fourth of the cost of a roof made of galvanized iron. It is, of course, less

durable, and rain water from a bark roof is usually discoloured by the sap of the bark and is not suitable for cooking purposes.

NOTE.—Timber from State Forests and Crown Lands can only be obtained under the authority of a formal permit signed by a Forest Officer. In such areas the stripping of trees solely for roofing and building purposes is forbidden by law owing to the destruction of trees involved.—EDITOR.

STATISTICS.

THIRD QUARTER, 1909.

Rainfall in Victoria.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding *monthly and quarterly averages for each Basin, deduced from all available records to date.*

Basin or District.	July.		August.		September.		Quarter.	
	Amount, 1909.	Average.	Amount, 1909.	Average.	Amount, 1909.	Average.	Amount, 1909.	Average.
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	319	334	491	303	252	282	1,062	919
Fitzroy, Eumerella, and Merri Rivers	251	377	469	326	265	299	985	1,002
Hopkins River and Mount Emu Creek	176	254	525	249	189	255	890	758
Mount Elephant and Lake Corangamite	187	245	534	234	177	253	898	732
Cape Otway Forest... ...	297	415	660	396	265	374	1,222	1,185
Moorabool and Barwon Rivers	226	230	564	234	165	249	955	713
Werribee and Saltwater Rivers	174	192	432	205	131	233	737	630
Yarra River and Dandenong Creek	257	320	493	303	287	323	1,037	946
Koo-wee-rup Swamp ...	256	316	616	318	304	342	1,176	976
South Gippsland	488	382	609	385	241	406	1,338	1,173
Latrobe and Thompson Rivers	435	310	612	337	411	371	1,458	1,018
Macallister and Avon Rivers	379	129	190	233	265	182	834	544
Mitchell River	418	199	187	217	221	250	826	666
Tambo and Nicholson Rivers	345	176	177	193	156	215	678	584
Snowy River	466	267	174	265	241	313	881	845
Murray River	203	204	343	187	135	183	681	574
Mitta Mitta and Kiewa Rivers	396	443	505	314	203	308	1,194	1,065
Ovens River	428	464	598	333	196	326	1,222	1,123
Goulburn River	279	291	454	250	199	240	932	781
Campaspe River	264	265	644	227	152	258	1,060	750
Loddon River	235	182	512	179	119	173	866	534
Avon and Richardson Rivers	197	149	494	159	65	155	756	463
Avoca River	199	183	488	167	101	156	788	506
Eastern Wimmera	227	237	646	222	111	208	984	667
Western Wimmera	287	239	435	206	149	196	871	641
Mallee Country	168	134	361	132	99	132	628	398
The whole State	273	230	471	231	177	232	921	693

100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State. (Oversea). Quarter ended 30.9.1909.	Quarter ended 30.9.1908.	Deliveries from the Government Cool Stores Quarter ended 30.9.1909.	Quarter ended 30.9.08.
Butter ...	... lbs.	2,268,340	476,372	1,242,472	461,440
Milk and Cream	... cases	36	70	35	70
Cheese ...	... lbs.	30,600	31,320	10,960	4,880
Ham and Bacon	... "	480	1,200	..	...
Poultry ...	... head	6,915	1,600	2,647	3,383
Eggs	... dozen	...	..	2,740	2,503
Mutton and Lamb	carcases	12,279	566	930	806
Beef	quarters	2,386	8	.	955
Veal	carcases	799	768	.	300
Pork	... "	123	38	631	
Rabbits and Hares	... pairs	566,400	985,398	62,994	127,871
Sundries ...	... lbs.	...	...	1,628	7,081

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea
Apples ...	7,835	—	10,886	3,377
Apples (Custard)	1	—	—	—
Apples (Dried)		—	—	—
Bananas, bs.	54,825	6,359	—	—
Bananas, cs.	6,547	4,165	929	—
Barley ...	7,752	16	—	—
Beans ...	—	94	—	—
Bran ...	—	500	—	—
Bulbs ...	2	20	4	—
Chillies ...	—	6	—	—
Citrons ..	2	—	—	—
Cocoa beans	—	700	—	—
Cocoanuts ..	18	935	61	—
Coffee beans	—	885	—	—
Copra ...	—	9	—	—
Cucumbers	559	—	21	—
Currants ...	—	1,450	—	—
Dates ...	—	2,850	—	—
Figs ...	—	25	—	—
Fruit—				
Canned ...	—	—	—	1,724
Dried ...	—		—	1,088
Mixed ...	—	10	1	—
Garlic ...	5	73	—	—
Green ginger	146	119	2	—
Hops .	37	40	—	—
Jams, Sauces, &c.	—	—	—	1,444
Lemons ...	3,716	—	370	1,773
Lentils ...	—	69	—	—
Linseed ...	—	1,071	—	—
Totals ...	81,452	19,417	12,274	9,406

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea
Loquats ...	82	—	—	2
Mace ...	5	94	—	—
Maize ..	2,794	4,223	—	—
Mangel Wurzels	6	—	—	—
Millet ...	—	20	—	—
Nutmegs .	—	195	—	—
Nuts ...	108	881	13	—
Oats ...	2,028	538	—	—
Onions ...	—	22	—	—
Oranges ...	119,175	—	203	1,206
Passion fruit	4,257	—	424	40
Paw Paws ...	2	—	—	—
Pears ..	1	—	7,317	292
Peas, Dried	331	391	—	—
Pepper ...	—	558	—	—
Persimmons	14	—	—	—
Pineapples	7,158	—	512	17[illegible]
Plants, Trees, &c.	275	389	702	46[illegible]
Popcorns ...	—	37	—	—
Potatoes	19,658	—	—	—
Prunes	—	600	—	—
Quinces ...	—	—	—	[illegible]
Rice ...	1,683	24,208	—	—
Seeds ...	769	3,110	4	
Shaddocks	—	—	—	1
Strawberries	14	—	—	—
Sultanas ...	—	909	—	—
Tomatoes .	1,763	—	1	—
Vegetables	1,483	254	1	—
Wheat ...	63	9	—	—
Yams ...	128	—	1	—
Grand Totals	243,249	55,855	21,452	11,59

Total number of packages inspected for quarter ending 30th September, 1909 = 332,153.

J. G. TURNER, *Senior Inspector, Fruit Exports and Imports.*

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. All inquiries must be accompanied by the name and address of the writer.

INJURY TO MARE.—P.E. states that five months ago a young draught mare of his had her chest badly torn, a portion of the bone becoming detached. Although the wound has healed, the chest is much swollen, a hard lump has formed, and it is impossible to work her.

Answer.—The swelling on the chest is caused by the detached bone not having been removed before allowing the wound to heal. If the abscess formed has not already broken, it will be advisable to open it up freely, extract the piece of bone, and thoroughly drain the cavity, washing out twice daily with a 2 per cent. solution of lysol. The mare will probably go sound after the wound has healed.

BLACK SWEAT IN FERRETS.—J.W. writes:—"A rabbit trapper in my district has recently lost nineteen out of twenty ferrets from a disease which he terms 'Black Sweat.' The first symptoms are redness and swelling of the eyelids, accompanied by mucous discharge. The animal becomes sluggish, and the fur is harsh and 'staring.' The inflammation extends to the mouth and nose, and the whole head appears saturated with a dark foul-smelling sweat. Death occurs in from a few hours to three or four days."

Answer.—Black Sweat in ferrets is a septic disease, the exact cause of which is at present unknown, and requires investigation for further elucidation, and to prove its amenability to treatment. To prevent the spread of the disease, isolation of the affected animals and extreme cleanliness in and disinfection of the hutches are imperative.

REDWATER IN CATTLE.—C.P.N. inquires as to the cause of redwater in cattle. He also desires to know whether a newly-calved cow should be allowed to eat her "cleanings." On one occasion, he buried a cow's cleanings a mile away from the place of calving, but the cow dug them up and ate them.

Answer.—(1) Redwater in cattle is a dietetic disease usually caused by rough innutritious feed. The best treatment to adopt is to give a drench composed of Epsom salts, 1 lb.; powdered ginger, 1 oz.; nitrate of potash, ½ oz.; to be given in a quart of water. A liberal supply of good nourishing diet is important. (2) Certainly not; apart from the absorption of putrefactive material, it is likely to cause acute indigestion.

DROPSICAL SWELLING.—G.W. states that several mares by the same sire in his district are swollen behind as if they were about to foal. When they are heated, the swelling appears to extend further, and the bottom of the womb hangs down 6 or 8 inches lower, presenting a very disagreeable sight.

Answer.—The cases mentioned appear to be dropsical, with prolapsed conditions of the posterior portion of the foal passage, and not the womb itself. If the mares are in foal, this condition is probably due to disturbed circulation in the part from pressure of the pregnant womb, in which case it would be inadvisable to do more than wash and gently massage the part with salad oil by pressing upwards towards the lips of the passage. This should be carried out twice daily until the mares foal. If the prolapse persists after foaling, the whole mass should be washed with a 2 per cent. solution of lysol, and gradually returned by hand pressure into the passage, and the lips closed with two deeply-inserted tape stitches.

INDIGESTION IN FILLY.—W.T. writes:—"Could you tell me what is wrong with my filly. If she has a feed of chaff with a little bran in it before she starts work, and another at midday, she gets bad and lies down, but does not struggle or roll much. The legs are stretched out, and occasionally the head is turned to the flank."

Answer.—The trouble with your filly is caused by indigestion, and is possibly due to irregular casting of the temporary teeth. An examination of the mouth should be made, and all irregularities corrected. The filly will then be benefited by a course of the following powders in the food twice a day for about a fortnight—sulphate of magnesia, 1 oz.; bi-carbonate of soda, ½ oz.; powdered ginger and gentian, 2 drams each.

COW'S MILK FOR FOAL OF DEAD MARE.—J.R.M. asks how to prepare cow's milk for foal of a dead mare.

Answer.—The proper way to prepare average cow's milk to rear the foal of a dead mare is by mixing two quarts of fresh cow's milk with one of lukewarm water, to which is added 1 tablespoonful of brown sugar. The sugar is preferable to molasses.

INFLAMMATION OF WOMB.—W.K.N. states that a mare of his foaled all right, but has since lost a lot of blood, and also gone stiff in the front legs as though she had been foundered through eating wheat. She stands about, but will not eat, and looks very dull.

Answer.—The mare is suffering from inflammation of the womb, and the foundered condition of the front feet is a common complication. The womb should be flooded out twice daily with two gallons of a lukewarm 2 per cent. solution of lysol, and during the warmer part of the day the mare should be made to stand in a shallow dam or creek to relieve the congested condition of the feet. The hind feet should be lower down than the fore ones in order to relieve the latter of a proportion of the body weight. Give in the drinking water, twice daily, 2 oz. of hypo-sulphite of soda. Exercise the mare at walking pace for half-an-hour after standing in the dam.

MISSHAPEN EGGS.—P.C.R. desires to know cause of fowls laying misshapen eggs.

Answer.—The primary trouble is ulceration of the oviduct, followed by a dilated spot in the egg passage, which affects the evenness of the egg. It is not uncommon amongst our non-sitting breeds. Pullets that have been unduly forced by stimulating food, condiments and excessive meat diet are likely victims to the disorder. Low diet, with plenty of vegetables is recommended. Avoid meat for a time, and do not feed any maize. As this complaint is an hereditary one, breeding from birds affected with ovarium troubles should be avoided.

COLOUR OF MUD IN DAM.—St. Arnaud asks how it is that the mud in the bottom of a dam sunk in red ground, the catchment of which is also red soil, is usually black.

Answer.—It is due to the amount of organic matter washed down from the catchment, which undergoes decay after being a short time in the water. Decayed organic matter always is of a dark colour, and it has also the property of changing all kinds of soil to more or less of a definite black tint.

RELATIVE VALUES OF LIME AND GYPSUM.—J.M. inquires as to the relative values of lime and gypsum as soil sweeteners on light sandy land.

Answer.—Both lime and gypsum have considerable value upon light sandy soils. Sandy soils, as a rule, do not require sweetening. Gypsum has a value of about one-third that of lime as a plant feeder, but it has other attributes which give it an added value. If you can procure gypsum locally, its use rather than that of lime, is recommended. If the soil is stiff clay and inclined to be sour, then use lime in preference.

INJURY TO FRUIT TREES BY RABBITS.—W.B. asks how to prevent rabbits and hares injuring young fruit trees. He wishes to know how to prepare mixture for painting the trees.

Answer.—Any preparation painted or smeared on young trees to prevent rabbits and hares gnawing the bark is only efficacious for a limited time. The better system is to securely wire-net the orchard so as to keep these animals out. Lime is generally the basis of "tree smears." Lime and sulphur, in the proportion of 1 lb. lime to 4 ozs. sulphur, boiled together, and mixed to the consistency of paint, is a good smear to use. A paint made of lime and fresh blood, or lime and rancid fat, is also good. In these cases the lime need not be boiled. A lime spray or wash does not injure the tree in in any way.

STOCKS FOR APPLES AND CHERRIES.—DONCASTER asks (1) whether apple seedlings raised from Northern Spy apple pips are recommended. (2) Which is the best stock for cherries.

Answer.—(1) Seedlings from any variety of apple show considerable variation from the parent, and rarely possess any of the parental characteristics. Hence, seedlings from the Northern Spy apple cannot be relied on to be at all blight resistant. It is not advisable, under any circumstances, to use such seedlings as stock. (2) The usual and most successful stock for cherries is a cherry generally known as the "Kentish." The fruit is small, bright red in colour, juicy, and possessing an acid flavour. It ripens towards the middle or end of December.

"Doncaster" is reminded that the name and address of the inquirer should accompany each request for information.

IRRIGATING POTATOES.—C.C. states that if he plants late potatoes he must irrigate. He desires information as to right method, and also as to best manure.

Answer.—(1) Do not flood the land; run the water slowly midway between the drills, allowing it to soak away under the surface to the roots of the plants. (2) Apply bonedust and superphosphate in equal parts, from 2 cwt. to 4 cwt. per acre; if the soil is deficient in potash, add 1 cwt. sulphate of potash to the above mixture.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE, VICTORIA.

VOLUME VII. Parts 1–12.

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